SFG1368 REV

**World Bank Loan Project**

# Tianjin Urban Transport Improvement Project

# Environment Management Plan

**Tianjin Environment Impact Assessment Center**

**World Bank Loan Office of Tianjin Municipal Urban and Country Construction and Transportation Committee**

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# Table of Contents

# Chapter I General Introduction

*Environment Management Plan* (EMP) is prepared by Tianjin Environment Impact Assessment Center (TEIAC) for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans. The *Environment Management Plan* is prepared in accordance with major conclusions and suggestions of *Project Environment Impact Assessment Report* (EIA), and includes the major contents of setting of organization institution for implementation of the environment management plan, major environment problems in the project implementation and operation, environment mitigation measures in all stages of the project, monitoring plan and report regulation and training plan and cost budget. In the project assessment stage, EMP shall be reviewed and approved by World Bank Loan Office of Tianjin Municipal Urban and Country Construction and Transportation Committee and shall be fully implemented in the project implementation stage.

Environment assessment is very important in the preparation process of the project to be constructed, and aims at predicting the potential impacts of the project to be constructed on the social environment and natural environment and formulating the environment impact mitigation plan. In the project preparation stage, the environment impact report is prepared to ensure that the environment problems can be fully solved and include these problems into all stages; Environment Management Plan is to propose measures and solutions for removing, reducing or mitigating adverse environment impacts and reducing the negative environment impacts to acceptable level. The environment management plan shall be carried out as part of the environment assessment work. In the project solution design process and environment assessment project, we shall full consider various factors such as project and cost, and finally determine the recommendation solution based on minimized environment impacts.

The environment impact assessment has been carried out as part of the project preparation and assessment, and the *Environment Management Plan* (EMP) has been formulated as part of environment impact assessment report. The report is prepared based on the environment impact assessment process, especially the identified adverse impacts in the project construction and operation period as well as corresponding mitigation measures to meet national and local environment standards and conform with applicable safety guarantee policies of World Bank. The environment assessment documents including the Environment Management Plan are the interactive products of project design personnel, and are also the comparative products of project solution design and environment sensitive targets protection solution to minimize the potential environment and social impacts of the project to be constructed.

To ensure the effective and feasible implementation of Environment Management Plan, the cost budget of environment protection measures shall be listed into the project budget in the project preparation stage, various environment mitigation measures shall be included into the technical standard documents for project procurement, environment management training shall be carried out for project managers, executors, construction supervision units and construction units, and training cost and consultancy fee for environment management plan shall be included into the total project investment estimation.

Meanwhile, the project owner will employ qualified and experienced environment monitoring consultants (EMC) outside the environment management plan to carry out independent external supervision work, supervise whether the construction units perform various environment protection measures in accordance with bidding documents and also supervise the validity and rationality of various environment protection measures proposed in the project preparation stage to provide further suggestions for optimizing and enhancing the environment stage in the construction period and usage period.

## 1.1 Project Objective

The proposed Urban Transport Improvement Project of Tianjin by Using the World Bank Loans (hereinafter referred to "Tianjin Urban Transport" or proposed project) is located in Tianjin. The project applies loans of $100 million from the World Bank, and project development objective (PDO) is to improve the service capability and efficiency of urban infrastructures;

(1) Improve the traffic speed of transit corridors, reduce the travel time of buses and add to increase the proportion of bus travel mode. Strive to reach 40% of public transport travel rate (including metro) by 2020.

(2) Reduce the urban carbon emission intensity by three measures of improving bus travel ratio, slow travel proportion and mobile vehicle travel speed and strive to reduce the energy consumption of unit transport amount by 30% in 2020 compared to 2013.

(3) Improve the slow traffic capabilities of existing roads, improve the travel ratio of bicycles and improve the slow travel rate in the center city area by 10% in 2020 compared to 2010.

Refer to Figure 1.1-1 Tianjin Municipal Location Map for construction contents of Tianjin urban transport project.

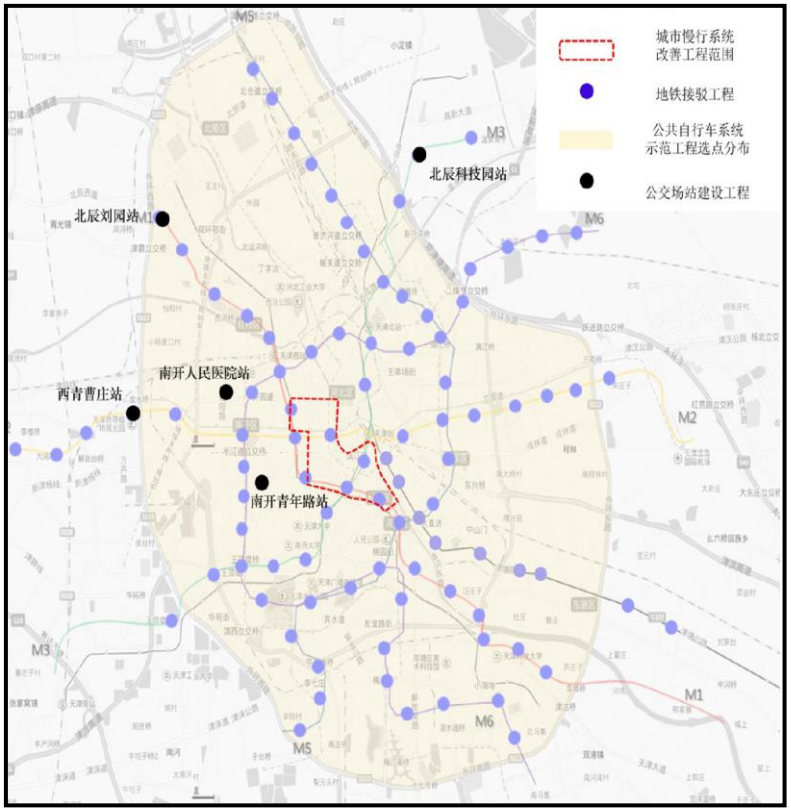


**Figure 1.1-1 Geographic Location Map of Tianjin Urban Transport Improvement Project**

## 1.2 Project Outline

Tianjin Urban Transport Improvement Project to be constructed is located in Tianjin city area, and belongs to urban transport improvement project. Urban Transport Improvement Project of Tianjin by Using the World Bank Loans includes two parts: road network smoothing system project; and technical support project. The road network smoothing system project includes four sub-projects of green transport (slow travel system) improvement project in the core zone of center city area, metro transit project, public bicycle system demonstration project and public transport station construction project.

Road network smoothing system project includes: ①green transport (slow travel system) improvement project in the core zone of center city area: plan to upgrade 42 roads in about 7.2 square kilometers in the center city area of Tianjin, and involve a total road length of about 49.7 kilometers; ②metro transit project: the project is to build transit facilities around 111 stations in total along metro line No.1, No.2, No.3, No.5, No.6 and No.9 of Tianjin, and occupies a total land area of 486,588 square meters. The technical support project includes 8 sub-items; ③public bicycle system demonstration project: build sound public bicycle operation and management system, set 446 public bicycle rental stations around the metro stations and purchase 12,370 public bicycles; and ④public transport station construction

project: build 5 bus stations in the center city area in total with a total land area of 32,000 square meters and a total building area of 132,000 square meters.

Technical support project includes: research on green transport development strategy in center city area in Tianjin; research on motor development policies and green gas emission in Tianjin; policy support system for optimizing public transit network in center city area; research on public bicycle management and operation model; multi-channel financing mechanism for sustainable development of urban road smoothing project; implementation standards for urban disaster prevention and recovery system project; demonstration platform for disaster prevention and recovery system; and advertising and promotion for comprehensive improvement of urban transport.

The project covers a permanent land area of 51.86 hm²(including 48.66 hm² of permanent land for metro transit project and 3.2 hm² of permanent land for bus station project). The project is planed to be started in 2016 and completed in 20178; and the total project investment is predicted to be RMB 1.426 billion Yuan, one-time project environment projection investment is RMB 27.09 million Yuan, and environment protection investment accounts for 2.6% of total project investment.

## 1.3 China's Framework of Laws and Regulations

### 1.3.1 Laws and Regulations

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

(2) Environmental Impact Assessment law of the People's Republic of China (September 1, 2003);

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

(4) Law of The People's Republic of China on Water and Soil Conservation (March 1,2011);

(5) Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (September 1, 2000);

(6) Law of the People's Republic of China on the Prevention and Control of Water Pollution (June 1, 2008);

(7) Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise (March 1, 1997);

(8) Law of the People's Republic of China on Prevention of Environmental Pollution Caused by Solid Waste (April 1, 2005);

(9) Law of the People's Republic of China on Response to Emergencies (November 1, 2007);

(10) Law of the People's Republic of China on the Protection of Cultural Relics (October 28, 2002);

(11) Highway Law of the People's Republic of China (August 28, 2004);

(12) Cleaner Production Promotion Law of the People's Republic of China (March 2, 2012);

(13) Circular Economy Promotion Law of the People's Republic of China (August 29, 2008) (President Decree [2008] No.4 of the People's Republic of China);

(14) Regulations on the Administration of Construction Project Environmental Protection (Decree No.253 of the State Council of the People's Republic of China);

(15) Decision of the State Council on Implementing Scientific Outlook on Development and Enhancing Environment Protection (the State Council Decree [2005]No.39)

(16) Measures for Environment Protection Management of Transport Construction Project (Decree [2003] No. 5 of the Ministry of Transport of the People's Republic of China);

(17) Notice on Environment Supervision of Transport Project (Decree [2004] No. 314 of Transport and Environment of the Ministry of Transport of the People's Republic of China);

(18) List of Classified Management of Environment Impact Assessment of Construction Project (Decree No. 2 of the Ministry of Environment Protection of the People's Republic of China);

(19) Notice on Relevant Problems of Environment Noise in Environment Impact Assessment on Construction Projects of Highway, Railway and Others (Decree [2003] No. 94 of Environment);

(20) Interim Method for Public Participation in Environment Impact Assessment (Decree [2006] No.28 of Environment);

(21) National Proposal for Response to Emergent Environment Incidents (January 24, 2006);

(22) Regulation on the Safety Management of Hazardous Chemicals (Decree No. 591 of the State Council of the People's Republic of China);

(23) Provisions on the Administration of Road Transport of Dangerous Goods (Decree [2010] No.9 of the Ministry of Transport of the People's Republic of China);

(24) Notice on Enhancing Highway Plan and Building Environment Impact Assessment (Decree [2007] No. 184 of Environment);

(25) Technical Policy for Noise Pollution Prevention and Treatment of Ground Transport (Decree [2007] No.7 of Environment)

(26) Guiding Suggestions on Enhancing Prevention and Treatment of Environment Noise Pollution and Improving Urban and Rural Sound Environment Quality (Decree [2010] No. 144 of Environment);

(27) Tianjin Municipal Management Method for Environment Protection of Construction Project (Decree No.58 of Tianjin People's Government)

(28) Tianjin Municipal Regulation on Air Pollution Control (revised in 2004) (Decree [2002] No. 52 of Tianjin Municipal People's Congress);

(29) Tianjin Municipal Management Method for Environment Noise Pollution Control (Decree [2003] No.6 of Tianjin People's Government);

(30) Tianjin Municipal Regulation on Urban Landscaping (2004);

(31) Tianjin Construction Standards for Urban Road Landscaping (2004);

(32) Tianjin Municipal Management Method for Water Pollution Control (Decree [2004] No. 67 of Tianjin People's Government);

(33) Tianjin Municipal Interim Method for Dust Prevention and Management of Construction Site (Tianjin Municipal Urban and Country Construction and Transportation Committee Decree [2004]149);

(34) Decision for Enhancing Environment Protection and Optimizing Economic Growth (JZ [2006] No.86);

(35) Tianjin Municipal Regulation on Civilized Construction (Decree [2006] No. 100 of Tianjin People's Government);

(36) Tianjin Municipal Regulation on Domestic Wastes (implemented as of May 1, 2008);

(37) 21 Prohibitions for Construction in Tianjin (September, 2009);

(38) Letter for Adjustment of Division of Applicable Areas of <Sound Environment Quality

Standards>in Tianjin (JHBGH [2010] No. 398 of Tianjin Municipal Bureau of Environment Protection);

(39) Tianjin Method for Implementation of Administrative License for Engineering Sediment Discharge (JRH [2005] No. 162 Document)

(40) Notice of Tianjin People's Government on Issuing Clean Air Action Plan (JZF [2013] No.35);

(41) Tianjin Proposal for Response to Heavy Pollution Air (JZF [2013] No. 88);

(42) Decision of Executive Committee of Tianjin People's Congress on Approval of Division of Ecological Area for Permanent Protection, 2013 (No.1 Notice of Executive Committee of Tianjin People's Congress);

(43) Notice on Implementing Three Tips for Environment Protection of Construction Project and Regulation for Acceptation on Environment Protection of Completed Work (JHBG [2012] No.3).

### 1.3.2 Technical Standards

(1) Technical Guideline for Environment Impact Assessment-General Principle, HJ/T2.1-2011;

(2) Technical Guideline for Environment Impact Assessment-Atmospheric Environment, HJ2.2-2008;

(3) Technical Guideline for Environment Impact Assessment-Surface Water Environment, HJ/T2.3-93;

(4) Technical Guideline for Environment Impact Assessment-Sound Environment, HJ2.4-2009;

(5) Technical Guideline for Environment Impact Assessment-Ecological Impact, HJ/T19-2011;

(6) Technical Guideline for Environment Risk Assessment of Construction Project,HJ/T 169-2004;

(7) Environment Impact Assessment Standard of Highway Construction Project, JTG005-96;

(8) Technical Standard for Urban Dust Pollution Control, HJ/T393-2007, the State Bureau of Environmental Protection;

(9) Technical Standard for Acceptance of Environment Protection for Completion of Constructed Project-Ecological Impact, HJ/T394-2007;

(10) Water and Soil Loss Control Standard of Development Construction Project (GB50434-2008);

(11) Water and Soil Loss Reservation Standard of Development Construction Project (GB50433-2008).

### 1.3.3 Relevant Plans

(1) Tianjin General Urban Plan (2005-2020);

(2) Tianjin Municipal Twelfth Five-year Plan on Integrated Transportation;

(3) Tianjin Intelligent Transport Plan for Center City Area;

(4) Tianjin Plan for Pedestrian Facilities in Center City Area;

(5) Tianjin Special Public Transport Plan;

(6) Tianjin General Plan for National Road Transport Junction;

(7) Tianjin Plan for Passenger and Freight Transport Junction;

(8) Tianjin Municipal Twelfth Five-year Plan on Development Strategies of Public Transport Group.

### 1.3.4 Project Documents

(1) Technical Contract for Project Assessment signed by project entrusting unit and Tianjin Municipal Environment Impact Assessment Center;

(2) Proposal for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., June, 2014;

(3) Feasibility Research Report-Outline for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

(4) Feasibility Research Report-Technical Support for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

(5) Feasibility Research Report-Public Transport Station Construction Project for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

(6) Feasibility Research Report-Public Bicycle System Demonstration Project for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

(7) Feasibility Research Report-Metro Transit Project for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

(8) Feasibility Research Report-Green Transport (Slow Travel System) Improvement Project in

the Core Zone of Center City Area for Urban Transport Improvement Project of Tianjin by Using the World Bank Loans, Tianjin Tianle International Engineering Consulting Co., Ltd., May, 2015;

### 1.3.5 Applicable Standards

The applicable standards for environment impact assessment are as follows according to environmental function zoning requirements.

#### 1.3.5.1 Water Environment

Waste water (sewage) is prohibited from discharging into the surrounding water body. Domestic sewage generated by the bus stations in the construction period shall be discharged into the municipal pipelines after the treatment in cesspool; construction waste water shall be used after the precipitation by oil separation and shall not be discharged to outside; and the waste water in the operation period shall be discharged to urban sewage pipelines and finally be discharged into urban sewage treatment plant. The waste water emission standards shall follow the third standard in *Integrated Waste Water Discharge Standard* (GB8978-1996). Refer to the specific standard value in table 1.3-1.

**Table 1.3-1 Integrated Waste Water Discharge Standard (GB8978-1996)**

| Standard No. | Standard Name | Standard Value and Grade | Pollutant | Standard Value（mg/L） |
|---|---|---|---|---|
| GB8978-1996 | *Integrated Waste Water Discharge Standard* | Third Grade | pH | 6～9 |
| | | | SS | 400 |
| | | | $BOD_5$ | 300 |
| | | | COD | 500 |
| | | | Petroleum | 20 |
| | | | Animal or Vegetable Oil | 100 |
| | | | Ammonia Nitrogen | / |
| | | | LAS | 20 |

#### 1.3.5.2 Atmospheric Environment

Refer to table 1.3-2 for GB3095-2012 *Environment Air Quality Standard*.

Table 1.3-2 Environment Air Quality Standard Unit:mg/$Nm^3$

| Pollutant / Time | $NO_2$ | $PM_{10}$ | $SO_2$ |
|---|---|---|---|
| One-hour average | 0.20 | 0.15 | 0.50 |
| Daily average | 0.08 | 0.07 | 0.15 |
| Annual average | 0.04 | — | 0.06 |

#### 1.3.5.3 Sound Environment

Settlements in the project assessment area shall follow Type I and Type 2 standards of Sound

Environment Quality Standard (GB3096-2008). Refer to table 1.3-3 *Sound Environment Quality Standard* for specific standard value.

Public stations shall follow Type 2 standards of *Environment Noise Discharge Standard in Industrial Enterprise Factory Boundary* (GB12348-2008), and construction boundary in the construction period shall follow relevant standards in *Environment Noise Discharge Standard in Construction Boundary* (GB12523-2011). Refer to specific standard value in table 1.3-4, 1.3-5 and 1.3-6.

**Table 1.3-3 Sound Environment Quality Standard (GB3096-2008)**

| Type | Day Time dB(A) | Night Time dB(A) |
|---|---|---|
| 1 | 55 | 45 |
| 2 | 60 | 50 |
| 4a | 70 | 55 |

**Table 1.3-4 Noise Discharge Standard in Industrial Enterprise Factory Boundary (GB12348-2008)**

| **Type** | Day Time | Night Time | Applicable Scope |
|---|---|---|---|
| Type 2 area | 60dB (A) | 50dB (A) | 1 m outside the bus station boundary |

**Table 1.3-5 Environment Noise Discharge Standard in Construction Boundary (GB12523-2011)**

| Day Time | Night Time |
|---|---|
| 70 dB | 55 dB |

## 1.4 World Bank Guarantee Policy

(1) Environmental Assessment (OP/BP4.01,1999.1)-the policy shall be fully applied.

(2) Natural Habitats (OP4.04，2001.6)-the project does not involve important natural habitats defined in the policy and the policy is not applicable.

(3) Pest Management (OP4.09,1998.12)-the project does not involve plant diseases and insect pests and the policy is not applicable.

(4) Indigenous People (OP4.10,1991.9)-people with aboriginal characteristics defined in OP4.10 are not found and the policy is not applicable.

(5) Physical Cultural Resources (OP4.11,1999.8)-protected cultural resources are involved in the surrounding areas of the project and the policy is applicable.

(6) Involuntary Resettlement (OP4.12,2001.12)-the project involves removal and the policy is applicable.

(7) Forests (OP4.36,1993.9)-the project does not involve land for forests use and the policy is

not applicable.

(8) Safety of Dams (OP4.37,2001.10)-the project does not involve dams, and the policy is not applicable.

(9) Projects on International Waterways-the project does not involve international waterways, and the policy is not applicable.

(10) Projects in Disputed Areas (OP7.60,2001.6)-the project does not involve disputed areas, and the policy is not applicable.

(11) Disclosure of Information (BP17.50,1993.9)-the policy shall be fully used in the project.

(12) Environmental, Health, and Safety Guidelines International Financing Company (IFC), World Bank (WB) *General Guideline for Environment, Health and Safety*-the policy shall be fully used in the project.

## 1.5 Environmental Sensitive Points

### 1.5.1 Ecological Protection Objective

The ecological protection objective mainly includes temporary land use and vegetable in the scope of land use.

### 1.5.2 Protection Objective for Environment Air and Sound Environment

Determine the protection objective for noise and atmospheric environment according to the project characteristics and site survey and investigation results, and summarize the environment protection objectives for sub-projects according to the characteristics of the project.

(1) Green transport (slow travel system) improvement project in the core zone of center city area mainly refers to protection objectives of sensible targets around the roads in the construction period, and mainly involves Heping District and Nankai District in the administrative areas. The results are shown as table 1.5-1.

Table 1.5-1 Environment Protection Objective for Green Transport (Slow Travel System) Improvement Project in the Core Zone of Center City Area

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| 1. | Wenxingli | West, 15m | Six three-floor residential buildings | Haerbin Road (Shanxi Road~Jiefang North Road) |
| 2. | Tianzengli | West, 15m | One three-floor residential building | |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| 3. | Xinyili | East, 15m | Two-story building | |
| 4. | Quanyechang Primary School | East, 10m | Two three-floor residential buildings | |
| 5. | Haerbin Road Residential Building | East, 15m | One five-floor residential building | |
| 6. | Yudeli Cell | East Side, 36m | Five five-floor residential buildings | Heping Road (Chifeng Road~Rongji Street) |
| 7. | Jianshe Road No.1 | East Side, 5m | One seven-floor residential building | Jianshe Road (Yingkou Road~Qufu Road) |
| 8. | Guangxue Xinli | West Side, 36m | One four-floor residential building | |
| 9. | Jianshe Road Building (Tongda Garden) | West Side, 18m | Two three-floor residential buildings | |
| 10. | Jianshe Road No.72 | West Side, 12m | One seven-floor residential building | |
| 11. | Tai'an Road No.34 | East Side, 12m | One six-floor residential buildings | |
| 12. | No. 61 Middle School | East Side, 12m | Two four-floor residential buildings | |
| 13. | Jianshe Road No.82 | East Side, 12m | One six-floor residential buildings | |
| 14. | New Cultural Garden Xinjingju | West Side, 30m | One thirty-floor residential buildings | Rongye Street (Nanma Road~Duolun Road) |
| 15. | Changchou Apartment | West Side, Opposite Side, 18m | Two residential buildings with 8~16 floors | |
| 16. | New Cultural Garden Xindianju | East Side, Opposite Side, 30m | Two eleven-floor residential buildings | |
| 17. | New Cultural Garden Xinyaju | East Side, Border Side, 30m | Four sixteen-floor residential buildings | |
| 18. | Wanlong New Cultural Garden | East Side, Border Side, 30m | Two sixteen-floor residential buildings | |
| 19. | Nankai No.2 Middle School | West Side, Opposite Side, 136m | One nine-floor teaching building | |
| 20. | New Cultural Garden Xinliju | West Side, Border Side, 20m | Two thirteen-floor residential building (floor No.1~floor No.3 are bottom commerce) | |
| 21. | Fudun Square | West Side, 20m | One residential building with thirty-three floors | |
| 22. | Rongqing Garden | West Side, 20m | One residential building with thirty-three floors | |
| 23. | Tianhui Shangyuan | East Side, 43m | Two residential buildings with thirty-three floors | |
| 24. | Tianhui Mingyuan | East Side, Nearest to 80m | Four residential buildings with thirty-three floors | |
| 25. | New World Garden | West Side, Nearest to12m | Four residential buildings with eleven floors | |
| 26. | Xinhui Huating | East Side, Nearest to 44m | Four residential buildings with thirty-three floors | |
| 27. | Yong'an Hospital | East Side, 20m Opposite Side | One outpatient hospital with four floors | |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| 28. | Tongfang Garden | East Side, 40m | One residential building with thirty-three floors | Henan Road (Fu'an Street~Duolun Road) |
| 29. | Qingyou West Li | West Side, 8m，Opposite Side | One five-floor residential building | |
| 30. | Qingyou East Li | East Side, 8m, Border Side | Five two-floor residential buildings | |
| 31. | Rongfangli Building No.2 | West Side, Opposite Side, 8m | One seven-floor residential building | |
| 32. | Yiren Xinli | West Side, Opposite Side, 10m | One six-floor residential building | |
| 33. | Fufangli | West Side, Opposite Side,10m | Two four-floor residential buildings | |
| 34. | Tianjin Dental Hospital | North Side, 30m | One four-floor impatient department, one eight-floor outpatient building | Dagu North Road (Zhangzizhong Road~Xuzhou Road) |
| 35. | Siping East Road Primary School | North Side, Border Side, 60m | One four-floor teaching building | |
| 36. | Dawenli | South Side, Border Side, 25m | Four six-floor residential buildings | |
| 37. | No.272 Hospital | East Side, 30m | One five-floor hospital | Nanmenwai Street (Nanma Road~Nanjing Road) |
| 38. | Dormitory Cell No.272 | East Side,Opposite Side, 33m | Two six-floor residential buildings | |
| 39. | Haiguang Xincun | East Side, 45m | Two residential buildings with eighteen floors | |
| 40. | Xinquan Building | West Side, 36m | One residential building with twenty-eight floors | |
| 41. | Huifu Tingyuan | West Side, 36m | One residential building with twelve floors | |
| 42. | Fuhou West Li Cell | East Side, Border Side, 33m | Two residential buildings with six floors | |
| 43. | Huaiyuanli Cell | East Side,Border Side, 76m | One six-floor residential building | |
| 44. | Huaiyuanli Cell | East Side, Opposite Side, 10m | One six-floor residential building | |
| 45. | Botai House | West Side, Border Side, 60m | Five six-floor residential buildings | |
| 46. | Botai Apartment | West Side, 25m | One residential building with fourteen floors | |
| 47. | Mingzhuxuan Cell | East Side, 45m | Two residential buildings with twenty-four floors | |
| 48. | Shengxin Garden | West Side, 30m | Two eight-floor residential buildings | |
| 49. | Nankai No.2 Middle School | East Side, 70m | Two six-floor teaching buildings | |
| 50. | Tianjin Chinese Vocational Middle School | East Side, 70m | Two teaching buildings with fifteen floors | |
| 51. | Heping Garden | South Side, Opposite Side, 30m | Two residential buildings with twelve floors (two floors of bottom commerce) | Fu'an Street (Nanmenwai Street~Zhangzizhong Road) |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| 52. | Tongfang Garden | South Side, 60m | Three residential buildings with thirty-three floors | |
| 53. | Qufu Road Cell | North Side, Nearest to 20m | Two six-floor residential buildings | Qufu Road (Taierzhuang Road~Nanjing Road) |
| 54. | Tianjin Public Security Hospital | South Side, 27m | Two six-floor residential buildings | |
| 55. | Huiwen Middle School | East Side, 20m | Connective four-floor residential buildings | Anshan Road (Nanjing Road~Xing'an Road) |
| 56. | Anshan Road Primary School | East Side, 5m | One four-floor teaching building | |
| 57. | Ningxia Road Door No.56 | West Side, 10m | One four-floor residential building | |
| 58. | Fuyuanli | East Side, 5m | Two two-floor residential buildings | |
| 59. | Jingbao College of Further Education | West Side, 8m | One five-floor office building | |
| 60. | Xinglong South Li | East Side, 12m | One seven-floor residential building | |
| 61. | Gengyu Li Building No.2 | East Side, 10m | Two two-floor residential building | |
| 62. | Tongfang Garden | North Side, 28m | Three residential buildings with twenty-eight floors | Duolun Road (Zhangzizhong Road~Nanmenwai Street) |
| 63. | Tianheli | South Side, 15m | Two-story building | |
| 64. | Fumingli | South Side, 18m | Three six-floor residential buildings | |
| 65. | Xinfu Fangli | North Side, Opposite Side, 12m | Two six-floor residential buildings | |
| 66. | New Cultural Garden Xinjingju | North Side, 10m | One residential building with twenty floors | |
| 67. | Tianjin Eye Hospital | South Side, Border Side, 28m | One outpatient building with eleven floors | |
| 68. | Jinlun Apartment | North Side, Opposite Side, 16m | One eight-floor residential building (two floors of bottom commerce) | |
| 69. | Sizhen North Li | South Side, Opposite Side, 16m | Two six-floor residential buildings | |
| 70. | Fuhou West Li Cell | North Side, 35m | Two-floor residential buildings | |
| 71. | Taifeng Li | West Side, 6m | Attached three-floor residential buildings | Chifeng Road (Nanjing Road~Zhangzizhong Road) |
| 72. | Aijian Apartment | South Side, Opposite Side, 16m | One six-floor residential building | Shaanxi Road (Rongye Street~Chifeng Road) |
| 73. | Yide Li | North Side, 10m | Attached three-floor residential buildings | |
| 74. | Zhishan Li | South Side, Opposite Side, 15m | One six-floor residential building | |
| 75. | Xinglong South Li | North Side, Opposite Side, 10m | Two seven-floor residential buildings | |
| 76. | Kangda Apartment | North Side, Opposite Side, 10m | Two residential buildings with eleven floors | |
| 77. | Guanghua Lane | North Side, Opposite | Two seven-floor residential | |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| | | Side, 10m | buildings | |
| 78. | Qingtai Li | North Side, Opposite Side, 10m | One six-floor residential building | |
| 79. | Yaohua Middle School | West Side, Opposite Side, 25m | Two eight-floor teaching buildings | Shanxi Road (Nanjing Road~Chifeng Road) |
| 80. | Yaohua Primary School | East Side, Opposite Side, 17m | Two four-floor teaching buildings | |
| 81. | Songshou Li | East Side,16m | Six seven-floor residential buildings | |
| 82. | Yaohua Primary School | South Side, 8m | Two four-floor teaching buildings | Baoding Road (Shanxi Road~Zhangzizhong Road) |
| 83. | Hongda Apartment | South Side, 10m | One seven-floor residential building | |
| 84. | Shude North Li, Shude South Li | Bilateral Sides, 10m | Two five-floor residential buildings | |
| 85. | Chongren Li | North Side, Opposite Side, 8m | One six-floor residential buildings | |
| 86. | Tongda Garden | South Side, Opposite Side, Nearest to 60m | One residential building with eleven floors | |
| 87. | Tongfang Garden | West Side, Opposite Side, 20m | Two residential buildings with twenty-four floors | Fu'an Street (Duolun Road~Rongji Street) |
| 88. | Baolijin Champagne | West Side, 20m | Three residential buildings with thirty-five floors | |
| 89. | Xinhua Road | Bilateral Sides, 5m | Five two-floor residential buildings | Xinhua Road (Nanjing Road~Duolun Road) |
| 90. | Xinjin Li | South Side, 8m | Three five-floor residential buildings | |
| 91. | Ziyang Li | South Side, 30m | Three residential buildings with eighteen floors | |
| 92. | Tailong Li | North Side, 10m | One two-floor residential building | |
| 93. | Lianbi Li | West Side, 5m | One four-floor residential building | |
| 94. | Baohua Li | West Side, 5m | Three residential buildings with two to three floors | |
| 95. | No.19 Kindergarten | West Side, 8m | Two-floor kindergarten | |
| 96. | Inpatient Department of Public Security Hospital | West Side, 15m | One six-floor impatient department | |
| 97. | Municipal CPPCC Committee | East Side, 30m | One office building with twelve floors | |
| 98. | Xinhua Road No.217~235 | East Side,5m | Four residential buildings with five to six floors | |
| 99. | Hami Road Primary School | South Side, Opposite Side, 20m | One four-floor teaching building | |
| 100. | Xinhua Road Two-Story House | Bilateral Sides, Opposite Side, 10m | Attached two-floor house | |
| 101. | Kaifeng Li | North Side, Border Side, 5m | One residential building with twenty-two floors | Xuzhou Road (Nanjing Road~Taierzhuang Road) |
| 102. | Taierzhuang Road | West Side, Opposite | Four residential buildings with | Taierzhuang Road (Yingkou |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| | Building No.2~5 | Side, 25m | seventeen floors | Road~Bengbu Road) |
| 103. | Mingyuanli Cell | West Side, Opposite Side, 22m | One residential building with twenty-two floors | |
| 104. | Nantongli Cell | West Side, Opposite Side, 15m | One five-floor residential building | |
| 105. | | West Side, Border Side, 40m | Three five-floor residential buildings | |
| 106. | Tiankang Garden | South Side, Opposite Side, 38m | Three residential buildings with thirty-three floors | Beima Road (Dongma Road~Xima Road) |
| 107. | Shangjia Xinyuan | South Side, Opposite Side, 36m | Five residential buildings with thirty-three floors | |
| 108. | Longting Garden | South Side, Opposite Side, 30m | Five residential buildings with thirty floors | |
| 109. | Northeast Corner Artist Residence | South Side, 107m | Three residential buildings with thirty-three floors | |
| 110. | Jingde Garden | West Side, Border Side, 20m | One residential building with thirty floors | Dongma Road (Beima Road~Nanma Road) |
| 111. | Xin'an Garden | West Side, Border Side, 66m | Two residential buildings with twenty-two floors | |
| 112. | Renheng Haihe Square | East Side,Border Side, 55m | Two residential buildings with thirty floors | |
| 113. | Tianjin First Intermediate People's Court | North Side, Opposite Side, 36m | One office building with twenty floors | Nanma Road (Dongma Road~Xima Road) |
| 114. | First Anti-Corruption Bureau of Tianjin People's Procuratorate | North Side, Opposite Side, 32m | One office building with twenty floors | |
| 115. | Pingxiang Building | North Side, Opposite Side, 24m | Two residential buildings with thirty floors | |
| 116. | Jinfeng Building | North Side, Opposite Side, 24m | Two residential buildings with thirty floors | |
| 117. | Youdian Apartment | South Side, Opposite Side, 48m | Four residential buildings with thirty-five floors | |
| 118. | Chengnan Garden | South Side, Opposite Side, 50m | One residential building with thirty-three floors | |
| 119. | Wei'an South Li Cell | West Side, Opposite Side, 25m | Two seven-floor residential buildings (1 floor of bottom commerce) | Xima Road (Beima Road~Nanma Road) |
| 120. | Wei'an Middle Li Cell | West Side, Opposite Side, 25m | Three seven-floor residential buildings | |
| 121. | Tianlin Garden | East Side, Border Side, Nearest to42m | Three residential buildings with twenty-four floors | |
| 122. | Wei'an North Li Cell | West Side, Opposite Side, 20m | Two seven-floor residential buildings | |
| 123. | Tianyue Garden | East Side, Border Side, 35m | Six residential buildings with thirty floors | |
| 124. | Zuyi Li | West Side, Opposite Side,20m | Four six-floor residential buildings | |
| 125. | Minzu Building Cell | West Side, Opposite Side, 15m | Two six-floor residential buildings | |

| Serial No. | Name of Sensible Target | Location and Distance | Scale | Name of Upgraded Road |
|---|---|---|---|---|
| 126. | Huanqing Building | West Side, Opposite Side, 15m | Three six-floor residential buildings | |
| 127. | Tiankang Garden | North Side, Opposite Side, 22m | Four residential buildings with thirty-three floors | Beicheng Street (Dongma Road~Xima Road) |
| 128. | Tianyue Garden | South Side, Opposite Side, 35m | Two residential buildings with thirty floors | |
| 129. | Zhongying Primary School | South Side, Opposite Side, 25m | One two-floor teaching buildings | |
| 130. | Tianjin Shuige Hospital | North Side, Opposite Side, 24m | One eight-floor hospital (outpatient+inpatient) | |
| 131. | Chonghua Middle School | South Side, Opposite Side, 55m | One four-floor teaching building | |
| 132. | Shangjia Xinyuan | North Side, Opposite Side, Nearest to 25m | Five residential buildings with thirty-three floors | |
| 133. | Longting Jiayuan | North Side, Opposite Side, 22m | Six residential buildings with thirty floors | |
| 134. | Jingde Garden | South Side, Opposite Side, 50m | Five residential buildings with thirty floors | |
| 135. | Xiyuan New House | South Side, Opposite Side, 114m | Two residential buildings with twenty-four floors | Gulou East Street (Chengxiang East Road~Dongma Road) |
| 136. | Ruyuan Apartment | North Side, Opposite Side, 20m | One eleven-floor residential building (one floor of bottom commerce) | |
| 137. | Sunshine Jingdian | South Side, Opposite Side, 30m | Four residential buildings with thirty-three floors | Nancheng Street (Dongma Road~Xima Road) |
| 138. | Tongluowan Garden | South Side, Opposite Side, 24m | Five residential buildings with thirty floors | |
| 139. | Tan Villa | West Side, 33m | Villa Zone | Chengxiang Middle Road (Beima Road~Nanma Road) |
| 140. | Renhe Haihe Square | West Side, Border Side, 20m | Four residential buildings with thirty floors | Zhangzizhong Road (Tongbei Road~Tongnan Road) |

(2) For the bus station project, the major environment protection object is the noise objectives in the construction period and operation period. Refer to table 1.5-2 for results.

Table 1.5-2 Collection of Sensitive Points for Project Noise and Atmosphere Environment of Bus Stations

| Serial No. | Name of Sensitive Point | Project | Distance（m） | Location | Function | Implementation Standards | |
|---|---|---|---|---|---|---|---|
| | | | | | | Sound Functional Zoning | For One Side of the Project |
| 1. | Gediao Spring Building No.4 | Nankai Youth Road Station | 24 | East | Residential Building | Type I | Type I |

| Serial No. | Name of Sensitive Point | Project | Distance（m） | Location | Function | Implementation Standards | |
|---|---|---|---|---|---|---|---|
| | | | | | | Sound Functional Zoning | For One Side of the Project |
| 2. | Gediao Spring Building No.7 | | 24 | East | Residential Building | Type I | Type I |
| 3. | Juruili | | 45 | South | Residential Building | Type I | Type 4a |
| 4. | Teaching Building of No.25 Middle School | | 40 | South | Teaching Building | Type I | Type II |
| 5. | Furong South Li | | 70 | West | Residential Building | Type I | Type I |
| 6. | Nankai Foreign Language Middle School | People's Hospital Station | 30 | West | Teaching Building | Type II | Type II |
| 7. | Shuijun Garden | | 80 | North | Residential Building | Type II | Type 4a |
| 8. | Honey Baby Kindergarten | Beichen Liuyuan Station | 10 | North | Kindergarten | Type I | Type I |
| 9. | Xijing Garden Cell | | 20 | East | Residential Building | Type I | Type I |
| 10. | New Children's Hospital | | 120 | West | Hospital under construction | Type I | Type 4a |

### 1.5.3 Protection Objective of Cultural Relics

Refer to the protection objective of cultural relics in the following table.

Table 1.5-3 Statistic Results of Environment Sensitive Targets

| Serial No. | Type of Sensitive Objective | Quantity (units) | Scale Estimation |
|---|---|---|---|
| 1 | Residence | 134 | 4,820 households and 20,800 persons |

| | | | |
|---|---|---|---|
| 2 | Hospital | 7 | 800 beds in total |
| 3 | School | 8 | About 14,350 students |
| 4 | Kindergarten | 1 | 100 children |
| 5 | Cultural relics | 54 | - |
| Total | — | 204 | 31990 |

As shown in table 1.5-3, the project involve 204 various sensitive objectives in all districts of Tianjin, including 134 residence sensitive points, 7 hospitals, 8 various schools and 1 kindergarten. There are a total of about 14,350 persons in the sensitive objectives.

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 1. | Original Wude Martial Arts Center | Slow Travel System Project Anshan Road | East Side,15m | One two-floor building with the building area of 2,200 square meters, and currently serves as the library of General Hospital of Tianjin Medical University | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 2. | Jing Garden | Slow Travel System Project Anshan Road | West Side, 10m | Two-story building with the building area of 4,020 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 3. | Zhang Garden (resident of Sun Zhongshan in Tianjin in his northern journey) | Slow Travel System Project Anshan Road | East Side,12m | Two-floor front aisle building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 4. | Duan Qirui Old Residence | Slow Travel System Project Anshan Road | West Side, 28m | Two-floor mansion with the building area of 2,016 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 5. | Original Zhejiang Industrial and Commercial Bank Building | Slow Travel System Project Binjiang Road | West Side, 16m | Two-floor main body with the building area of 2,043 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 6. | Old Jitai Building Residence | Slow Travel System Project Binjiang Road | East Side,14m | Five floors for main body and four floors for the two ends with the building area of 8,620 square meters and the occupied area of 2,100 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 7. | Old North Bureau Residence of the CPC Central Committee | Slow Travel System Project Binjiang Road | West Side, 43m | Two-floor brick structure, residence building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 8. | Old Xinhua Trust Bank Building | Slow Travel System Project Binjiang Road | West Side, 14m | Six-floor building, currently serves as the Tianjin Department Store Business Trade Corporation | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 9. | National Hotel | Slow Travel System Project Haerbin Road | East Side,50m | Three-floor steel concrete framework structure with the building area of 5,188 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 10. | Great China Theater | Slow Travel System Project Haerbin Road | West Side, 15m | Five-floor building with an occupied area of 2,700 square meters and a building area of 7,798 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 11. | Old Continental Bank Residence | Slow Travel System Project Haerbin Road | West Side, 10m | Brick concrete structure for three-floor building with a building area of 4,895 square meters and an occupied area of 2,021 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 12. | Old French Municipal Council | Slow Travel System Project Haerbin Road | East Side,16m | Four-floor western building with a building area of 5,608 square meter | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 13. | Bohai Building | Slow Travel System Project Heping Road | North Side, 22m | Eight floors for the main body and 13 floors for the local part with the general height of 84.2 meters and building area of 2,648 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 14. | Huizhong Restaurant | Slow Travel System Project Heping Road | South Side, 22m | Six-floor building with a building area of 11,940 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 15. | Tianjin Quanyang Chang | Slow Travel System Project Heping Road | South Side, 8m | Steel concrete framework structure for buildings with 5 floors for main body and 8 floors for corner parts, and with a building area of 21,000 square meters | Heping District | Type II | National key cultural relics protection unit |  |
| 16. | Old News Office Residence | Slow Travel System Project Heping Road | North Side, 12m | Brick concrete structure for two-floor general building with a building area of 1,620 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 17. | Secrete Printing Plant of CPC Central Committee in Tianjin | Slow Travel System Project Jianshe Road | West Side, 36m | Two-floor building with a building area of 370 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 18. | Old Residence of New Life Society | Slow Travel System Project Jianshe Road | West Side, 46m | Brick wood structure for two-floor general building with a building area of 63 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |
| 19. | Old Residence of Lu Hongtao | Slow Travel System Project Jianshe Road | West Side, 15m | Three-floor building with an occupied area of 2,060.67 square meters and a building area of 1,958.80 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 20. | Old Residence of Melchers | Slow Travel System Project Dagu North Road | West Side, 18m | Four-floor building with a building area of 2,400 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 21. | Old Residence of Garden Building | Slow Travel System Project Dagu North Road | West Side, 14m | Brick concrete structure for five-floor building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 22. | Original Building of Kailuan Coal Mining Administration | Slow Travel System Project Dagu North Road | West Side, 10m | Three-floor mixed structure with underground with building area of 9,180 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 23. | Old Residence of Nathan | Slow Travel System Project Dagu North Road | West Side, 23m | Chinese quadrangle courtyard with a building area of 360 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 24. | Old Residence of Office of Eighteen Group Army in Tianjin | Slow Travel System Project Dagu North Road | East Side,20m | Three-floor building in brick concrete structure | Heping District | Type II | Heping District cultural relics protection unit |  |
| 25. | Old Residence of Christian Association of Young Women | Slow Travel System Project Dagu North Road | West Side, 10m | Two-floor building with a building area of 1,440 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 26. | Old Residence of Dakuo Restaurant | Slow Travel System Project Qufu Road | South Side, 40m | One five-floor helmet tower with the building area of 3,792 square meters, and for commercial use | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 27. | Old Residence of Ren Fengbao | Slow Travel System Project Chifeng Road | West Side, 16m | Two-floor villa building with a building area of 1,131 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |
| 28. | Old Residence of Li Houji | Slow Travel System Project Chifeng Road | West Side, 14m | Two-floor building with a building area of 150 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 29. | Old Residence of Zhang Xueliang | Slow Travel System Project Chifeng Road | West Side, 9m | Three-floor western building with a building area of 1,418 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 30. | Old Residence of Fan Zhuzhai | Slow Travel System Project Chifeng Road | West Side, 11m | Two-floor mansion building with a building area of 3,459 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |
| 31. | Old Residence of Tianjin General Bureau of Telegraph | Slow Travel System Project Chifeng Road | East Side,24m | Three-floor brick concrete structure building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 32. | Old Residence of Zhang Gonghui | Slow Travel System Project Chifeng Road | East Side,48m | Two-floor European building with a building area of 1,083 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 33. | Old Residence of Qiao Tiehan | Slow Travel System Project Chifeng Road | West Side, 23m | Two-floor western building with a building area of 1,214 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |
| 34. | Old Residence of Jiuda Salt Company | Slow Travel System Project Chifeng Road | East Side,15m | Three-floor western building with an occupied area of 2,500 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 35. | Old Residence of Banque de I'IndoChine | Slow Travel System Project Chifeng Road | East Side,10m | Three-floor underground building with a building area of 3,651 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 36. | Old Residence of Commercial Guarantee Bank Of China | Slow Travel System Project Chifeng Road | West Side, 20m | Western two-floor building with a building area of 1,319 square meters and an occupied area of 884 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 37. | Old Residence of Yien Yieh Commercial Bank | Slow Travel System Project Chifeng Road | West Side, 12m | Three-floor mixed structure with an occupied area of 3,174 square meters and a building area of 6,244 square meters | Heping District | Type II | National key cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 38. | Old Residence of Purple Bamboo Camp | Slow Travel System Project Chifeng Road | East Side,10m | One quadrangle courtyard and one building with 2~4 floors with an occupied area of 6,534 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 39. | Old Residence of Chen Zhuling | Slow Travel System Project Baoding Road | North Side, 15m | Two-floor building with three floors in local parts and a building area of 2,166 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 40. | Lihua Building | Slow Travel System Project Baoding Road | North Side, 41m | Steel concrete framework structure for a main building with 10 floors and total building area of 6,193 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 41. | Old Residence of Butterfield & Swire Co | Slow Travel System Project Baoding Road | North Side, 15m | Brick wood structure for two-floor building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 42. | Old Residence of Na Tong | Slow Travel System Project Xinhua Road | West Side, 20m | Two-floor European building with a building area of 1,380 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 43. | Old Residence of Ji Hongchang | Slow Travel System Project Huayuan Huandao Road | South Side, 19m | Two-floor (three-floor in local parts) western building in brick wood structure and with a building area of 1,160 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 44. | Old Residence of Zhang Ruiting | Slow Travel System Project Huayuan Huandao Road | East Side,36m | Three-floor building with basement, currently serves as Tianjin Commercial Chamber | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 45. | Old Residence of Zhuang Lefeng | Slow Travel System Project Huayuan Huandao Road | East Side,22m | Building with three floors for the main body and 2~4 floors for local parts | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 46. | Old Residence of Li Minzhong | Slow Travel System Project Huayuan Huandao Road | North Side, 25m | Two-floor European building with a building area of 1,221 square meters | Heping District | Type II | Cultural relics to be classified |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 47. | Old Residence of Li Jifu | Slow Travel System Project Huayuan Huandao Road | North Side, 20m | Two-floor mix structure with an occupied area of 5,434 square meters and a building area of 4,891 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |
| 48. | Original Tianjin Customs | Slow Travel System Project Zhangzizhong Road | West Side, 30m | Three-floor western building with a building area of 4,746 square meters | Heping District | Type II | Heping District cultural relics protection unit |  |
| 49. | Old Residence of Belfran Building | Slow Travel System Project Zhangzizhong Road | West Side, 6m | Steel concrete structure for a building with five floors and a building area of 3,973 square meters | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 50. | Old Residence of Yuzhong Restaurant Building | Slow Travel System Project Zhangzizhong Road | South Side, 8m | Brick concrete structure for a building with three-floor top roof, building area of 5,026 square meters and 150 natural rooms | Heping District | Type II | Cultural relics to be classified |  |
| 51. | Old Residence of Continental Bank Warehouse | Slow Travel System Project Zhangzizhong Road | South Side, 13m | Building with six floors for the main body and six floors for local parts | Heping District | Type II | Cultural relics to be classified |  |
| 52. | Chongde Lane-Type Residence | Slow Travel System Project Qufu Road | South Side, 40m | 8 residential buildings with an occupied area of 4,900 square meters and building area of 10,820 square meters | Heping District | Type II | Historic relics building |  |

| Serial No. | Name of Protected Cultural Relics | Corresponding Project | Location and Distance | Scale and Function | Administrative District | Noise Implementation Standard | Protection Level | Site Photo |
|---|---|---|---|---|---|---|---|---|
| 53. | Old Residence of Sun Yuankong | Slow Travel System Project Xinhua Road | West Side, 5m | One three-floor building | Heping District | Type II | Tianjin municipal cultural relics protection unit |  |

# Chapter II Setting of Environment Management Planning Agency

The effective implementation of Environment Management Plan requires full participation of related parties of the project, including Environment Protection Bureaus (EPB) at all levels; project initiator, namely project management office (hereinafter referred to as "project owner"or "project office"); contractor, namely construction unit and construction supervision company (CSC) appointed by the owner and environmental monitoring consultant (EMC) of environment management plan entrusted by the owner. The environmental management structure is shown in Figure 2-1.

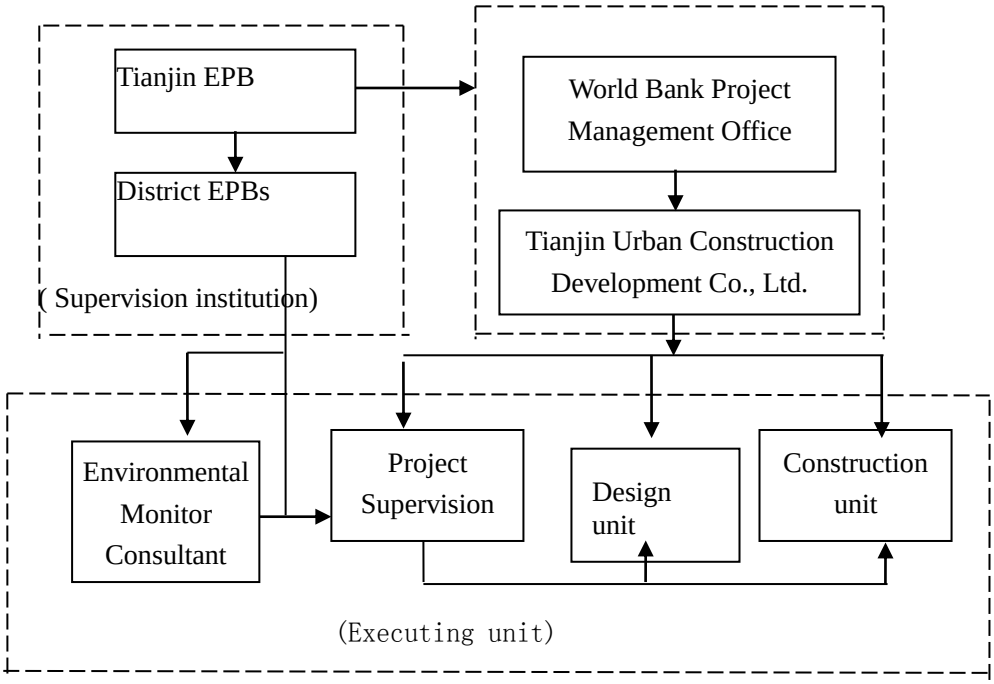


Figure.2-1 Schematic Diagram of Environmental Management Agency for this Project

Refer to table 2-1 for major environment responsibilities of major related parties and personnel allocation during all stages of the project.

Table 2-1 Arrangement and Responsibilities of Project Environment Management Agency

| Stage | Related Parties of Project | Environment Responsibilities |
|---|---|---|
| Project Preparation Stage | Tianjin Environment Protection Bureau (TEPB) | Review environment impact report. |
| | Involve the environment protection bureaus of all districts | Assist the project office in carrying out the environment impact assessment work during the preparation stage. |

| Stage | Related Parties of Project | Environment Responsibilities |
|---|---|---|
| | Project Management Office (PMO) for World Bank Loan of Tianjin Municipal Urban and Country Construction and Transportation Committee | Be responsible for organizing the implementation of Environment Management Plan (EMP) and organizing the design unit to include the environment mitigation measures into technical standards when the bidding documents are prepared. |
| Construction Period | Project Management Office (PMO) | 1. Guide, supervise and coordinate various work in the implementation period;<br>2. Regularly submit the progress report on EMP implementation (semi-annual report and annual report) to the World Bank. |
| | Tianjin Urban Construction Development Co. (PIU) | 1. Manage the construction activities and enforce the implementation of EMP;<br>2. Report to PMO on environmental management |
| | Contractor | 1. Be responsible for implementation for EMP and other environment protection measures;<br>2. Be responsible for organizing the construction personnel to participate in environment protection training. |
| | Construction Supervision Engineer (CSE) | 1.Carry out daily supervision to ensure the implementation of environment protection measures;<br>2. Pay attention to record the implementation and existing problems of environment protection measures in the monthly supervision report. |
| | Environmental Monitoring Consultant (EMC) | 1. Carry out environmental monitoring according to the monitoring plan in the EMP to verify the impacts of construction;<br>2. Provide monitoring report to PMO |
| | Involve the environment protection bureaus of all districts | Check the environment management during the construction period. |
| Operation Period | Project Management Office, Owner Unit | Same as construction period. |
| | Environment protection bureaus in all districts of Tianjin | 1. Organize the acceptance for three items for environment protection facilities at the same time;<br>2. Check the environment management situations during the operation period. |
| | Qualified supervision unit | Monitoring for the operation period and accident monitoring. |
| | Tianjin Urban and Rural Planning Bureau | Control the construction of sensible targets for bilateral development of newly built roads. |

## 2.1 Environment Protection Bureau (EPB)

As supervision department, bureaus at all levels shall formulate environment laws, regulations and policies for construction and operation of project, and be responsible for forcible implementation of laws, regulations, standards, guidelines and relevant environment policies within the scope of authority.

Environment Protection Bureau is the highest functional department of environment protection in

China,and shall guide Tianjin Environment Protection Bureau for forcible implementation of relevant laws and regulations; Tianjin Environment Protection Bureau shall review and approve the environment impact assessment report and guide environment bureaus at all districts for general environment management of the project; and the environment protection bureaus of all districts shall be directly responsible for supervision and forcible implementation of environment laws, regulations and standards.

As a provincial environment supervision and administration agency, Tianjin Environment Protection Bureau has the following roles and responsibilities:

1) Supervise the implementation of environment management plan;

2) Forcibly implement applicable laws, regulations and standards;

3) Coordinate matters related to environment protection among relevant departments;

4) Check and supervise the construction, completion and operation of environment facilities;

5) Guide the environment bureaus at municipal and county levels to manage the environment.

Environment protection bureaus at all districts shall have the following roles and responsibilities:

1) Supervise the construction unit to implement the environment management plan, and forcibly implement the applicable laws, regulations and standards;

2) Coordinate matters related to environment protection among relevant departments;

3) Check and supervise the construction, completion and operation of environment facilities within the scope of authority.

## 2.2 Owner Party (Project Management Office)

PMO of Tianjin Municipal Urban and Country Construction Committee (hereinafter to as "World Bank Project Management Office", PMO) shall be directly responsible for construction management and implementation of EMP, and take the ultimate responsibility for environment management during the construction and operation periods. The main responsibility of PMO includes:

I. In the project preparation stage, organize qualified and experienced environment assessment units to prepare project environment assessment reports, including supporting and supervising the environment assessment units to complete *Environment Impact Assessment Report* and *Environment Management Plan* to meet relevant domestic laws, regulations, standards and technical guidelines and requirements of safety guarantee policies of the World Bank and obtain the approval of local competent department for administration of environment protection and review of safety guarantee policy department of the World Bank.

II. Ensure the interaction of environment impact assessment consultancy unit and project research and design consultancy unit to combine with mitigation measures and other environment aspects to

integrate the procedure and requirements into integration of project design and include the cost of environment protection measures into the total engineering investment.

III. The final supervisor for environment mitigation measures and other environment protection measures during the construction period shall integrate the environment requirements into the construction contract, organize the training on contractors, construction supervisors and local project office, implement other environment management procedure and organize regular inspection on the construction site.

IV. Implement and supervise the environment supervision procedure, review the supervision journal of construction supervision company (CSE) as well as external monitoring report of external monitoring company (EMC) of environment management plan, check the environment performance of contractors, and adopt necessary rectification actions to respond to the problems and suggestions found in the external monitoring report, including any urgent situations and accidents in the construction period.

V. In project preparation and implementation stages, carry out public consultancy to local public, relevant agencies, World Bank and other shareholders to ensure them to fully understand the existing potential environment problems and mitigation measures in the project process and listen to their problems and suggestions on environment protection.

Tianjin Urban Construction &Development Co. will act on behalf of the PMO to supervise the implementation of EMP. The main responsibilities include:

I. Establish environmental unit as part of the construction management system, with dedicated staff who will be responsible for managing and supervising the environmental performance of contractors, and reporting the environmental management work to the PMO.

II. Review and approve detailed environmental management plans from contractors;

III. Supervise the construction sites and inspect the environmental performance of contractors, and cause the contractors to take remediation actions if necessary;

IV. Ensure supervision companies to sufficiently supervise the environmental performance of contractors as part of their duties;

V. Report the environmental management works to the PMO.

## 2.3 Contractors

During the construction stage, the project contractor is one key link for environment management, pollution control and impact mitigation. The contractors shall adopt a series of measures to ensure and be aware of the responsibilities and obligations for environment protection. The obligations of the contractor and special environment management personnel shall include but not be limited to:

a) The mitigation measures and requirements listed in the EMP shall be included into the bidding

documents for land construction project and shall serve as the annex for construction contract. The contractor must strictly implement the measures specified in the report of *Environment Management Plan*;

b) The contractor shall take the initiative to perform the environment responsibilities and provide the environment performance journals once per day or once per week. These records shall be submitted to the construction supervisor and reviewed by the project office and construction supervisor, and shall be subject to self-inspection and rectification;

c) Observe the requirements of relevant environment laws;

d) Work in the scope of contract and other tender conditions;

e) Each contractor shall arrange one special person to be responsible for implementation of environment protection measures and work jointly with External Monitoring Company (EMC) of environment management plan appointed by the owners for implementation of mitigation measures, site inspection and correction measures indicated by any owners and/or EMC of owners.

f) After receiving the indications from owners and External Monitoring Company (EMC) of environment management plan appointed by the owners, shall stop the construction activities that general unfavorable impacts; if necessary, adopt other construction methods to minimize the environment impacts;

g) The contractor requires sufficient public participation in the community of construction site, and set outstanding index labels at all sections to describe the major construction activities and construction periods in the special site. Meanwhile, the index labels shall provide the contract name, contact person and telephone number for the social pubic to facilitate them to express their cares and complaints on the construction activity;

h) Before the start of the construction, all contractors are required to participate in the forcible environment training, mainly including the contents in the following 8 aspects:

1) National and local laws, regulations and standards;

2) Environment assessment reports;

3) Environment mitigation measures;

4) Cultural and assessment and protection provisions;

5) Emergency measures;

6) Environment monitoring methods and requirements as well as report procedure specified in the contract;

7) Long-time public consultancy and response;

8) Environment protection obligations of the contractor.

## 2.4 Construction Supervision Engineer (CSE)

The construction supervision engineer (CSE) shall be responsible for due supervision on the construction activities and work of contractors in the construction to observe the relevant environment laws, regulations, technical guidelines, standards, specifications and contract requirements. The supervision engineers shall take the following responsibilities:

a) Review the design of construction organization plan and detailed environmental management action plan of contractors to ensure compliance of Environment Management Plan requirements. The construction activities shall not be carried out before the supervision engineer approve the environment measures;

b) Provide necessary assistance in the project management and supervision for owners and EMC appointed by the owners;

c) Regularly check the environment management of contractor in site. If the supervision contractor believes that the environment management personnel of the contractor fail to observe the responsibilities or contractual requirements, they shall indicate the contractor to change the environment management personnel;

d) Require the contractor to adopt rectification measures within the specified time. In case of breach of contract and strong public complaints, the supervision engineer shall order the contractor to correct, change or stop work, and also report to relevant agencies and owners;

e) Supervise the activities of the contractor and ensure to fully meet the requirements of environment management plan and the mitigation measures specified in the contract;

f) Indicate the contract to take actions to reduce the impacts and prevent from the occurrence of breach of contract in accordance with the approved requirements of *Environment Management Plan*;

g) Once any environment problems occur, the contractor shall solve the environment problems in the current month and shall be paid after the recognition of the supervision engineer;

h) If the contractor finds any cultural relics in the construction site, the supervision engineer shall order them to protect the site and inform relevant units and owners;

i) Adhere to follow the procedure for complaint investigation.

## 2.5 Environmental Monitoring Consultant (EMC)

Engaged by the PMO, the EMC will:

a) Carry out environmental monitoring according to the monitoring plan in the EMP to verify the impacts of construction;
b) Provide monitoring report to the PMO.

# Chapter III Project Environment Impacts

The proposed project will produce sewage, noise and solid wastes in the implementation process, which may cause certain impacts on the surrounding environment. In this chapter, we will analyze the possible environment problems and their impacts of the proposed project in the construction period and operation period from such eight aspects as ecological environment, water environment, sound environment, environment air, solid wastes, accident risk, accumulated impacts and social impacts.

## 3.1 Ecological Environment

(1) The road construction in the project may increase certain amount of permanent land use and remove the green isolation belts, border trees, lawns, shrubs and others along the roads in the implementation process. Thus, in the construction process, the green area in the ecological system will be reduced, the total plant coverage rate will be reduced and adjustment function of the ecological system will be certainly reduced. However, the affects plants are common species in the scope of assessment, and have wide growth scope and high adaptability. They will be disappeared or extincted in the area. After the completion of construction, the road landscape will compensate partial ecological losses.

(2) After the completion of the project, the overall land use of Tianjin will be increased. Despite the benefits to the urban transport, the increase of concrete and asphalt coverage will certainly intensify the urban heat island effects. Especially in the early completion of the land, the landscape function has not appeared, and the heat island effects are most obvious.

(3) Construction soil, spoil and piled construction debris will bring some impacts on the ecological environment, and are mainly expressed that extraction and discharge of soil may disturb the original flora and fauna habitats and destroy the vegetation; the extraction of soil may cause low-lying locations, change the original drainage system and form local water accumulation; and the extraction of soil may damage the soil structure, drop the fertility and decline the soil productivity.

(4) In the excavation and placement of concrete and formation of road base, the ground cover vegetation is damaged, the original soil structure is destroyed, and slopes are formed. Under function ground runoff of rain water, surface runoff may be formed due to the height difference between the road base and bilateral sides, soil particles may be taken away, and soil erosion is

formed. In the construction process, water and soil losses cannot be avoided in case of rainstorm. As it is predicted, the water and soil loss amount in the project is 2,358 t, in which the water and soil loss amount in the construction period (including construction preparation period) is 1,562 t, the water and soil loss amount in the natural recovery period is 797 t, and new water and soil loss amount is 1,579 t.

(5) The construction process may inevitably affect the various ground and underground lines and pipes in the urban municipal project, such as water supply and drainage pipelines, gas pipes, heat pipes and communication power pipes. Some pipelines are also required to be relocated and transferred, and may damage the urban roads and affect the urban landscape. In the construction process, foundation excavation, earthwork, and piling of building materials, especially the temporary piling of construction wastes and building garbage will also affect the urban health environment and urban landscape.

(6) Upgrading the artificial landscape belts formed by the central landscape on the two sides of roads and green project for bus stations will bright new scenery and modern atmosphere for the roads.

## 3.2 Water Environment

### 3.2.1 Construction Period

The main sources of sewage during the construction period are living sewage of construction personnel and construction waste.

(1) The construction and living conditions of construction personnel are simple, and living sewage is less. The living sewage is mainly from sewage from daily life and fecal water. The sewage mainly contains various organic matters such as animal fats, food residue and detergents. If they are directly discharged without treatment, adverse impacts may be caused for the surrounding water quality. After the construction, the impacts of living sewage will disappear.

(2) The machinery waste water from construction is mainly the waste water from cleaning and maintenance of machines and vehicles. Rinse sewage may be generated when the machines and transport vehicles are maintained in the project. The rinse sewage contains high amount of sediments. According to the investigation on construction waste water in similar project, the rinse sewage of construction machines and vehicles contains 50~80mg/L of COD, 1.0~2.0mg/L of oil and 150~200mg/L of SS. The construction waste water will pollute the water along the roads if they are directly discharged. It is prohibited from directly discharge into rivers along the roads. The construction waste water shall be recycled after the precipitation by oil separation.

### 3.2.2 Operation Period

The waste water in the project is mainly from living sewage, sewage from toilets and oily waste water from small kitchens of employees of sub-items of bus stations. The living sewage and public toilet sewage shall be precipitated through septic tanks, and oily waste water shall be discharged with other living sewage after the precipitation by oil separation. Thus, the discharged water quality is basically similar as the water quality of living sewage of general urban residents.

It is predicted the concentration of major pollutants in the discharged sewage can meet the requirements of DB12/356－2008 Integrated Waste Water Discharge Standard (third level), and can be discharged according to the standards. The sewage will be finally discharged into local treatment plant for treatment, and thus the discharge route is feasible; the sewage amount in the operation period is less, and there are no significant impacts on the work load of the sewage treatment plant.

## 3.3 Sound Environment

### 3.3.1 Construction Period

In the earthwork stage of operation of the single machine, the noise value at 60 m away from the construction machine during the construction in day time can meet the standard of 70dB(A) in accordance with *Discharge Standard of Environment Noise in the Building Construction Boundary*, and the noise value at 300 m away from the construction machine during the construction in night time can meet the standard of 55dB(A); in the structural stage, the noise value at 40 away from the construction machine during construction in night time can meet the standard of 70dB(A) in accordance with *Discharge Standard of Environment Noise in the Building Construction Boundary*, and the noise value at 200 m away from the construction machine during the construction in night time can meet the standard of 55dB(A).

In the project, the mainly affected subjects include residential areas, schools, hospitals, kindergartens and others. As the sensitive points are uniformly distributed within 5~200 m of the construction site, the construction machinery noise may cause different degrees of influences during the construction period, in which the construction noise exceeds the standard by about 3.0~14.0dB(A) in day time and exceeds the standard by about 2.0~24.0dB(A) in night time.

### 3.3.2 Operation Period

(1) Predication Results on Environment Impacts of Transport Noise

According to the engineering materials, the nine roads of Nanmeiwai Street, Fu'an Street, Rongye Street, Heping Road, Beicheng Street, Baoding Road, Anshan Road, Dagu North Road and Shaanxi Road represent the different road grades, sectional modes and motor flow of 38 roads (excluding sidewalks) in this environment assessment. Thus, the impacts of transport noise on the

environment quality for other roads in the operation period can refer to the above calculation results.

a. The two sides of roads at different grades are significantly impacted by the transport noise. The prediction results for the level sections indicate that the noise impact value is relatively greater as the vehicle flow in the operation period is higher; the impact of transport noise is lower as the distance from the road is greater.

b. Noise values at the red line of Shaanxi Road (10 m away from the center line) during day time and night time are respectively 67.6, 61.6dB(A), and are decreased as 48.6, 42.5dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 28 m away from the center line for Shaanxi Road in day time is lower than 60dB(A), and the noise value at 53 m away from the center line in night time is lower than 50dB(A).

c. Noise values at the red line of Dagu North Road (10 m away from the center line) during day time and night time are respectively 72.5, 66.5dB(A), and are decreased as 53.5, 47.5dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 63 m away from the center line for Dagu North Road in day time is lower than 60dB(A), and the noise value at 130 m away from the center line in night time is lower than 50dB(A).

d. Noise values at the red line of Anshan Road (15 m away from the center line) during day time and night time are respectively 72.6, 66.6dB(A), and are decreased as 55.5, 49.5dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 92 m away from the center line for Anshan Road in day time is lower than 60dB(A), and the noise value at 184 m away from the center line in night time is lower than 50dB(A).

e. Noise values at the red line of Baoding Road (10 m away from the center line) during day time and night time are respectively 72.7, 66.7dB(A), and are decreased as 53.7, 47.6dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 65 m away from the center line for Baoding Road in day time is lower than 60dB(A), and the noise value at 133 m away from the center line in night time is lower than 50dB(A).

f. Noise values at the red line of Beicheng Street (15 m away from the center line) during day time and night time are respectively 74.1, 68.1dB(A), and are decreased as 57.1, 51.1dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 121 m away from the center line for Beicheng Street in day time is lower than 60dB(A), and the noise value at 237 m away from the center line in night time is lower than 50dB(A).

g. Noise values at the red line of Heping Road (20 m away from the center line) during day time and night time are respectively 75.0, 69.0dB(A), and are decreased as 58.8, 52.8dB(A) at the

site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 165 m away from the center line for Heping Road in day time is lower than 60dB(A), and the noise value at 307 m away from the center line in night time is lower than 50dB(A).

h. Noise values at the red line of Rongye Street (15 m away from the center line) during day time and night time are respectively 75.1, 69.1dB(A), and are decreased as 58.0, 52.0dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 142 m away from the center line for Rongye Street in day time is lower than 60dB(A), and the noise value at 273 m away from the center line in night time is lower than 50dB(A).

i. Noise values at the red line of Fu'an Street(20 m away from the center line) during day time and night time are respectively 77.0, 71.0dB(A), and are decreased as 60.8, 54.8dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 228 m away from the center line for Fu'an Street in day time is lower than 60dB(A), and the noise value at 408 m away from the center line in night time is lower than 50dB(A).

j. Noise values at the red line of Nanmenwai Street (25 m away from the center line) during day time and night time are respectively 76.8, 70.8dB(A), and are decreased as 61.3, 53.3dB(A) at the site of 200 m away from the center line; the standard distance predication result indicates that the noise value at the site 248 m away from the center line for Nanmenwai Street in day time is lower than 60dB(A), and the noise value at 439 m away from the center line in night time is lower than 50dB(A).

k. The vertical section predication results indicate that for buildings 10 m away from the red line of roads at different grades, the noise impacts show the tread of "gradual increase-maximum value-gradual decrease" as the height increases. The maximum values for noise in day time and night time of Nanmenwai Street, Fu'an Street, Rongye Street, Heping Road, Beicheng Street, Baoding Road, Anshan Road, Dagu North Road and Shaanxi at 10 m away from the red lines are respectively 64.2,58.2dB(A); 69.2,63.1dB(A); 70.3,64.2dB(A); 69.3,63.3 dB(A); 71.8,65.8 dB(A); 72.8,66.8dB(A); 72.8,66.7 dB(A); 74.8,68.8 dB(A); 74.8,68.7dB(A). The maximum value basically appear at the height of third~fifth floor.

The above calculation results are obtained under the ideal conditions of empty land without building shields. In facts, for areas with many lines of buildings along the roads, the general transport noise has relatively significant impacts on the buildings in the first line along the roads, and relatively slight impacts on the buildings in the first line not along the roads.

(2) Analysis on Noise Prediction of Bus Stations

a. Xiqing Bus Station: the impact value of bus noise on the eastern and northern boundaries in the peak meets the requirements on limit value in day time according to GB12348-2008 Noise Discharge Standard in Industrial Enterprise Factory Boundary (Type II).

b. Qingnian Road Station: the impact value of bus noise on the eastern and northern boundaries in the peak meet the requirements on limit value in day time according to GB12348-2008 Noise Discharge Standard in Industrial Enterprise Factory Boundary (Type I). The aggregate value of noise impacts on protection objectives of Gediao Spring No.4 and Gediao Spring No.7 exceeds the limit value according to GB3096-2008 Sound Environment Quality Standard (Type I) because the current noise background value exceeds the standard. The noise increase amount is 0～0.1dB(A). It basically has no impacts on the current sound environment for residents of Gediao Spring.

c. Nankai People's Hospital Station: the impact value of bus noise on the eastern boundary in the peak meets the requirements on limit value in day time according to GB12348-2008 Noise Discharge Standard in Industrial Enterprise Factory Boundary (Type II). The aggregate value of noise impacts on protection objectives of Yameili and Nankai Foreign Language Middle School meets the requirements according to GB3096-2008 Sound Environment Quality Standard (Type II).

d. Comprehensive Hub Station of Beichen Science and Technology Park: the impact value of bus noise on the eastern boundary in the peak meets the requirements on limit value in day time according to GB12348-2008 Noise Discharge Standard in Industrial Enterprise Factory Boundary (Type III).

e. The impact value of bus noise on the eastern, southern and northern boundaries in the peak meets the requirements on limit value in day time according to GB12348-2008 Noise Discharge Standard in Industrial Enterprise Factory Boundary (Type I). The aggregate value of noise impacts on protection objectives of Honey Baby Kindergarten and residential building of Xijing Garden exceeds the limit value according to GB3096-2008 Sound Environment Quality Standard (Type I) because the current noise background value exceeds the standard. The noise increase amount is 0～0.1dB(A). It basically has no impacts on the current sound environment.

## 3.4 Environment Air

### 3.4.1 Construction Period

(1) In the construction process, the construction site may cause TSP pollution under the effects of wind. According to the actual investigation materials on similar projects that have been built, the construction dust for buildings without shields are very serious, and the pollution scope can reach 250 m from the site in the downwind direction. The TSP concentration of affected area is averagely 0.756mg/m$^3$ and is 1.87 times the comparative point and 2.52 times the quality standard of atmosphere environment. If the shields are provided, the construction dust is significantly improved compared to the situations without shields. The scope of dust pollution is within 200 m away from the site in the downwind direction, and TSP concentration of affected area is reduced by 1/4. The TSP concentration of affected area is averagely 0.585mg/m$^3$ and is 1.4

times the comparative point and 1.95 times the quality standard of atmosphere environment. As it is confirmed that the distance between the environment protection objective and construction site is less than 100 m, the area is affected by construction dust; the areas with relatively great impacts are pedestrians in the construction section and environment protection objectives such as residential buildings 50 m within the construction site.

(2) According to the construction of other urban roads in Tianjin and other cities, asphalt fume basically does not have significant impacts on the residential area 50 m away from the construction site if commercial asphalts are used to pave the road surface. Moreover, we currently apply fast-curing modified asphalt. Open-air operation can also timely diffuse a small amount of asphalt. Thus, as long as we rationally adjust the proportion in the project to shorten the time of asphalt transport vehicles to wait in the site, the asphalt fume will not cause significant impacts on the environment protection objectives.

### 3.4.2 Operation Period

1. Analysis on Bus Exhaust Impacts

The public buses are parked in open air, so that few exhausts are emitted in an intermittent mode. The project site area shall be wide and open, and facilitate the diffusion of pollutants. It is predicted that the exhaust air of buses will not cause significant impacts on the surrounding environment in operation period. It is prohibited to use outdated vehicles. We shall select novel qualified vehicles with exhaust emissions that conform with the requirements on environment protection and ensure the good vehicle conditions in the operation period.

2. Analysis on Vehicle Exhaust Impacts

a. For branch road with section surface of 20 m, the $NO_2$ concentration in the areas 15 m away from center line of bilateral roads in the heating period and non-heating period meets the daily concentration requirements according to GB3095-1996 Environment Air Quality Standards (Second Grade), and the $NO_2$ concentration in the areas 200 m away from center line under most unfavorable conditions meets the concentration requirements according to Environment Air Quality Standards (Second Grade).

b. For sub-branch road with section surface of 20 m, the $NO_2$ concentration in the areas 15 m away from bilateral roads in the heating period and non-heating period meets the daily concentration requirements according to GB3095-1996 Environment Air Quality Standards (Second Grade), and the $NO_2$ concentration in the areas within 30 m meets the requirements; and the prediction points within 200 m under most unfavorable conditions exceed the standard value.

c. For sub-branch road with section surface of 25 m, the $NO_2$ concentration in the areas 50 m away from bilateral roads in the heating period and non-heating period meets the daily concentration requirements according to GB3095-1996 Environment Air Quality Standards (Second Grade), and the $NO_2$ concentration in the areas within 80 m meets the requirements; and the prediction points within 200 m under most unfavorable conditions exceed the standard value.

d. For main trunk with section surface of 40 m, the $NO_2$ concentration in the areas 150 m

away from bilateral roads in the heating period exceeds the standard, and the $NO_2$ concentration in the prediction points 200 m away from roads in non-heating period and unfavorable conditions also exceeds the standard.

e. For main trunk with section surface of 90 m, the $NO_2$ concentration in the areas within 150 m away from bilateral roads in the heating period, non-heating period and unfavorable conditions also exceeds the standard.

f. With the increase of width of section surface, the scope of exceeding the standard for NO2 concentration is gradually increased mainly due to the increase of section width and increase of vehicle flow.

3. Kitchen Fumes

The waste gas from kitchens in bus stations is mainly from cooking, food processing and others. The waste gas shall be collected by collecting hood and discharged. Natural gas is clean energy, few pollutants are discharged and no significant impacts on environment are caused.

## 3.5 Solid Wastes

### 3.5.1 Construction Period

The solid wastes in the construction period are mainly from excavation of earthwork, construction garbage from house relocation and living garbage of construction personnel.

According to the primary estimation on engineering materials, we shall maximally allocate the earthwork for construction. The project excavation is 128,700 $m^3$, the filled earthwork is 147,800 $m^3$ and spoiled earthwork is 103,000 $m^3$. The spoiled oil in the project shall be allocated by soil management department and transported by transport unit recognized by the government for use in other projects. As some solid wastes are linearly distributed along the roads in the construction period, they may damage the plants and pollute the water along the roads if they are not properly placed or timely disposed; they may also generate dust and cause impacts on residents if they are placed for a long time. Thus, in the construction period, we shall enhance the construction management, and timely clear and dispose to reduce and prevent from such impacts.

The construction personnel in the construction peak include about 200 person, and generate about 0.20 t of living garbage everyday. The living garbage of construction personnel such as food residues, plastic package and waste cells may influence the landscape and cause extreme pollution on the environment if they are piled up in disorder. The unorganized placement of garbage will cause stench, attracting a large number of mosquitoes and rats, and posing a threat to the health of

the construction personnel. The unprotected wastes may generate pollution fluid, and cause pollution to the water and soil. In particular, waste cells contain a large amount of heavy metal, which may cause extreme pollution to water and soil.

The living garbage generated by the construction personnel shall be collected and centrally disposed by environment sanitation department. The building wastes shall submitted to Tianjin Urban Soil Management Department for uniformly transporting to construction waste landfill for disposal; it is predicted the solid wastes generated in the construction period may cause little impacts on the surrounding environment after the above measures are adopted.

### 3.5.2 Operation Period

Solid wastes mainly include the living garbage of employees of bus stations and solid wastes after vehicle maintenance.

Living garbage: mainly from the kitchen wastes and waste packages of employees in the stations as well as living garbage in the buses. As passengers stay for a relatively short period, there are basically garbage. The municipal appearance department shall be responsible for clearing the living garbage in bus stations, living garbage collection devices shall be set in the stations, the garbage shall be packed, and buses shall be provided with temporary devices for storage of living garbage to ensure to timely dispose the solid wastes and prevent from secondary pollution.

Waste oil: oily solid wastes generated after overhaul of bus stations are hazardous solid wastes (belong to HW08 waste mineral oil). After the centralized collection, the construction unit shall submit to qualified unit for recycling and no environment impacts will be caused.

## 3.6 Accident Risks

The project belongs to large municipal projects. Due to the factors such as construction methods, organizational management, personnel composition, construction environment and working period, various accidents cannot be avoided in the construction. Activities that may cause major influences on the environment include construction destruction of water supply and drainage pipelines and gas pipelines, combustion and exposition of such flammable and explosive products as diesel fuel and gasoline.

(1) Environment Risk of Destruction of Water Supply and Drainage Pipelines

These risks are mostly failure to understand the paving the existing underground pipelines in the construction area or improper use of construction machines. The outcomes mainly include that: sewage and tap water flow to roads to cause water accumulation on roads and even cause soil and water losses and accumulation in the

drainage pipelines. These accidents can be removed by closing valves or repairing the leakages, and will basically cause substantial impacts on human health and environment quality.

(2) Environment Risk of Destruction of Gas Pipelines

Once gas pipelines are destroyed, the direct environment impact is leakage of gas or natural gas, thus affecting the atmosphere quality nearby. More serious impacts of these accidents are risks of explosion of leaked gas, and the sharp increase of gas or natural gas in the air may cause suffocation. After such accidents occur, it takes a period of time to reduce the pollutant concentration in the air to the original level.

(3) Environment Risks of Combustion and Explosion of Diesel and Gasoline

If the construction is not well managed, accidental combustion and explosion of stored diesel and gasoline may occur in the construction site. The direct imptacts are CO and $NO_X$ pollution on the environment air generated by diesel and gas combustion, but these accidents generally influence the work site and basically do not case great impacts on the sensible objectives out side the work site. Currently, as relevant departments vigorously advocates civilized construction and enhance site management, the probability of such accidents is very low. Moreover,it is not allowed to keep large amount of flammable and consumable products in the urban construction area, so that the probability of such accidents is not high.

There are various accidents in the construction period. Most accidents mainly cause personal injury and property damage, and only few accidents have direct and obvious impacts on the environment. From analysis on the causes of accidents, most accidents are caused by mismanagement and operational errors, and some cases are caused by unclear pipeline routes and depth. Thus, most accidents can be avoided if we enhance construction management, intensify the responsibility awareness and make detailed investigation before construction. In recent years, there are basically no great environment accidents in Tianjin during the municipal construction.

## 3.7 Analysis on Social Environment Impacts

The construction vibration of machines gets smaller as the distance increases. At site 30 m away from the vibration source, Z vibration level is less than 72 dB, which meets the vibration standards for 72 dB in night time according to *Urban Regional Environment Vibration Standard*. However, the site 10~20 cm away from the vibration source will be affected. In particular, the construction during night may cause obvious impacts on the surrounding sensible points. Thus, we must enhance control and management on the high vibration construction machines and equipment.

According to the road relations between the project and cultural relics unit, the project undergoes many cultural protection units which are mostly distributed in the city center. After the confirmation of relevant cultural relics departments, there are 54 cultural protection units and relics buildings, 2 national key cultural protection units, 41 Tianjin cultural relics protection units, 7 regional cultural relics protection units and 4 unclassified cultural relics. After the site construction, the project will not occupy the protection scope of cultural relics, which are located outside the red line. Thus, the construction will not cause direct occupation and destruction.

In accordance with relevant provisions of *Law of the People's Republic of China on Cultural Relics Protection*, *Regulation for Implementation of Law of the People's Republic of China on Cultural Relics Protection* and *Regulation of Tianjin on Cultural Relics Protection*, to maximally reduce the impacts of the project on the cultural relics, the construction unit plans to adopt the following measures to enhance the protection on the cultural relics. Before the construction, they shall investigate the cultural relics in the scope of construction site and immediately stop work to protect the site if any cultural relics are found to prevent any personnel from moving or damaging the them. They shall immediately to administration department of cultural relics for protection.

## 3.8 Analysis on Accumulated Effects of Other Construction Projects in the Same Period

The renovation and construction of metro transit projects are carried out in the same period as metro line No.5 and No.6. When several closely connected projects are constructed at the same time, the flow of a large amount of construction vehicles, transport and discharge of construction materials and other construction activities will further sharpen the pollution of dust, exhaust gas and noise on residents along the road, and also increase the adverse effects on the safe travel of residents along the roads. In addition, the simultaneous construction of several projects may case greater transport pressure on transport along the roads and increase the probability of accidents.

# Chapter IV Environment Impact Mitigation Measures

We shall adopt measures to enhance the favorable impacts and reduce unfavorable impacts for the potential impacts of the project. The mitigation measures referred in the section mainly target at the unfavorable impacts generated in the project design and implementation process. The contractor shall formulate detailed and specific implementation plans for environment measures of all branch projects and construction sites. This requirements is also included into the bidding documents of the contractor. Refer to the major environment mitigation measures in the following table.

The contractor shall ensure that the required mitigation measures are fully implemented in the construction period. The external monitoring company (EMC) of environment management plan appointed by the owner shall supervise general environment protection performance and respective obligations and responsibilities of the contractor and report the problems to the project management office to adopt necessary actions.

## 4.1 Environment Mitigation Measures in the Design Stage

### 4.1.1 Mitigation Measures for Social Environment Impacts

In the planning and design, we shall optimize the design based on the principle of people first according to the current conditions to avoid the impacts on the urban landscape, fully consider regional status, construction conditions and other factors, and set temporary facilities for routes and projects to maximally avoid land occupation, avoid environment sensible points and avoid the relocation of buildings. We shall combine with Tianjin general plan and relevant plans to select and design routes and finalize a solution that conforms with relevant general urban plans.

In the route planning and solution selection, we shall strictly follow the requirements of overall plan of Tianjin, fully consider the current situations of project site and properly handle the ecological environment issues in the area to improve the service quality and overall efficiency of urban transport facilities, meet the demands for industrial structural adjustment and planning layout in the future and realize the “connected and shared” requirements of regional transport so as to promote the regional overall development, and enable the road serve the regional economic transport without damaging the ecological environment and landscape.

### 4.1.2 Mitigation Measures for Land Occupation

(1) In the project construction, land occupation cannot be avoided. We shall design the routes based on the important principle of less occupation of cultivated land, green land and water resources;

(2) In the design stage, we shall also well build construction sites, construction routes and other temporary projects to reduce the number of lands in temporary land occupation, especially the amount of green land and water fields not occupied.

## 4.2 Environment Mitigation Measures in the Construction Stage

The construction activities may cause different degrees of influences on the environment

along the roads, especially the environment of sensible points. The contractor shall be obliged to protect the environment and reduce the impacts on the environment during the construction stage of the project. The mitigation measures for environment impacts in the construction stage shall be included into the bidding documents and shall serve as important terms of engineering contract for implementation to urge the construction personnel to adopt feasible and effective environment protection measures for construction sites and areas nearby to protect the environment and ensure the safety of local residents and construction personnel.

### 4.2.1 Social Environment Impact Mitigation Measures

(1) Before construction, we shall fully make various preparation, make detailed investigation on such contents as roads, water, power supply and communication, and collaborate with relevant departments in advance for confirmation of relocation and transfer programs to ensure various emergent preparation and normal status of social life. The schedule of these disruptions should be notified to families in affected neighborhoods ahead of the disruption. Traffic deviations should also be informed to communities in advance.

(2) Set notice labels at outstanding positions of the construction site to describe the major contents, construction time, completion time and others and enable the social public to understand the inconvenience brought by the construction. The notice labels shall be noted with contact person, complaint hot line and others. For construction near special sensible targets such as schools and hospitals, we shall set safety and convenient temporary passages for entry and exit of students and patients. Especially for construction near hospital emergency service sites, we shall not affect the normal entrance of ambulances. Construction in or near sensitive receptors such as schools, hospitals and clinics should follow restricted schedules through consultation with schools and hospitals, to minimize impacts. Contractor shall facilitate school children to leave the area after school day is over, no evening or early construction works near hospitals.

(3) Accessibility: contractors should be required to guarantee accessibility to homes and businesses with proper safety considerations.

(4) If ancient and famous trees indeed need to be relocated in the construction process, we shall handle the transplant license and organize the construction in accordance with relevant provisions for transplant of ancient and famous trees; and once the cultural relics are found in the construction process, the construction unit shall immediately stop the construction, protect the site and notify the administrative department of cultural relics.

(5) As the surrounding cultural relics buildings are located outside the red line after site survey, the construction will not cause direct invasion and destruction. Before the construction, we shall investigate the cultural relics within the scope of construction site. Once cultural relics are found, we shall immediately stop the work to protect the site and prevent any personnel from moving and damages, and immediately report to the administrative department of cultural relics for protection.

(6) The equipment with general vibration may also generate noise. As the vibration is

transmitted through earth medium, its decay rate is greater than the noise. Thus, for the same equipment, the vibration protection distance is smaller than the noise protection noise. The noise protection and mitigation measures are also applicable to vibration. The noise control measures shall be implemented, and impacts of vibration on the environment can also be controlled.

(7) Maximally reduce the construction affects on the public services. If the affects cannot be avoided, timely notify the residents and shorten the affected time as far as possible.

(8) Build effective complaints mechanism. The contractor and owners shall be received by special personnel.

### 4.2.2 Environment Air Pollution Mitigation Measures

During the construction of all sub projects, we shall adopt feasible measures to prevent from dust pollution and enhance the dust governance near construction site in the six urban districts with dense environment sensible points. As Tianjin Air Pollution Control Regulation, Interim Method of Tianjin for Dust Control and Management in Construction Site, Tianjin Clean Air Action and other documents have proposed clear prevention measures, we shall adhere to them for implementation. In combination with the project features, we propose the following control measures:

(1) Formulate and implement dust pollution governance programs for the construction site, and include the dust control situations in the credit management system of the building enterprise as an important evidence for bidding and bid invitation; all projects shall be provided with sign labels with name of construction unit, name of project manager, telephone number, dates of start and planned completion, approved document No. of construction license and others and labels with environment protection measures.

(2) In the construction site, we shall strictly adopt the engineering measures such as sealing, high shields and spray, harden the sites except the operation site and fully cover or afforest other sites. The soil shall be collectively piles by the methods of coverage or curing; and the construction programs must be provided with environment protection measures for leakage and spray pollution and prepare operation standards for dust prevention.

(3) Set shields in the construction site to separate the site from the outside field, in which the shields shall conform with relevant provisions in terms of heights, materials, entrances, width and others; meanwhile, adopt simple forestation measures for employ land not to be developed temporarily;

(4) Avoid the entrances of site to cause any impacts on the local transport, set

vehicle rinse facilities at the entrances of the construction site, and arrange special persons to wash the vehicle wheels and vehicle sideboards and clean the entrances to ensure that the vehicles drive without mud and vehicles shall also be discharged in a civilized manner during transportation.

(5) Set water spray and cleaning regulations in the project construction site, and appoint special person to be responsible for spraying water and cleaning at least twice (work start, work end) every day; in addition, discharge of scatter materials, transport and other procedures may generate great amount of dust, and thus shall be carried out under clear weather. It is prohibited to carry out operations that may cause a great amount of dust in case of weather with wind of fourth grade or above.

(6) Often keep the construction site clean, timely clear and transport the project spoil, keep the pedestrian passages clean, level and smooth; in case of dry and dusty earthwork operation, spray water to control dust, and shorten the operation time in dust.

(7) Keep the completeness of carriages for transporting spoil and building material without overload, maintain normal vehicle speed and prevent from scattering during the transport process. All transport materials must be shielded with tarpaulins.

(8) Rationally plan the routes for construction transport vehicles, and drive according to the designated routes; arrange special persons to be responsible for clearing the mud on the roads, and timely clear them out; for road sections with high requirements on the environment, select to transport during night according to the actual conditions to reduce the impacts of dust on the environment; and select the transport methods according to the local conditions, maximally adopt large-tonnage dump trunk and mechanical vehicles to reduce the transition step, and forbid to transport in overload.

(9) Regularly inspect the construction dust and exhausts of construction machines and construction transport vehicles; forbid to use bad fuels, and enhance the mechanical maintenance to fully burn the power materials and reduce the exhaust emission;

(10) Completely adopt commercial asphalt concrete in the project, and prohibit to burn any wastes and materials that may generate harmful and toxic gases, smoke and odor, and use sealed device for loading molten pitch and other toxic materials; and if restaurants are set in the site, use clean energy, and forbid to use coal ranges or apply wood, asphalt felt and paint as fuel energy.

(11) Forbid to pile cement and lime in open field in the construction process, and reduce using lime, blending lime or other operations that may cause serious dust pollution in site; strictly forbid to apply the waste building materials as fuel energy, and timely recover the roads and plants in the occupied land after the construction.

(12) According to the relevant requirements in Notice of Tianjin People's Government on Forwarding Management Method of Tianjin for Control of House Demolition Dust Drafted by Bureau of Land and House Administration, set shields for house demolition according to relevant municipal provisions, and forbid the over flow of soil; in dismantling houses and cleaning soil, spray water to control the dust and avoid dust pollution; in dismantling houses in the construction site, comprehensively control the dust by setting high shields, spraying and other methods, timely clear the garbage from demolition, set storage sites for those that cannot be cleared temporarily and adopt dust control measures such as shields and water spray; and in case of wind of fifth grade or above (including fifth grade), stop house demolition.

(13) Enhance management, implement management accountability system, and advocate construction in a civilized manner. Must set expenses for construction in a safe and civilized manner, and ensure the special fund to be used for designated purpose. Refer to the specific technical details for dust control measures in relevant requirements of Technical Standard for Control of Urban Dust Pollution (HJ/T393-2007).

(14) Implement the emergency proposal for heavy pollution weather in Tianjin and implement the work suspension measures according to the warning levels for heavy pollution weather based on the requirements of emergent proposals.

### 4.2.3 Water Environment Impact Mitigation Measures

During the construction period, the construction unit shall organize the design for discharge of ground water, and strictly prevent the vehicle rinse water and living sewage from polluting the environment in the construction process. In the operation period, the roads may generate surface runoff in the natural rain, which may also cause certain impacts on the surface water environment. In this assessment, we propose the following prevention measures according to the project features and routes that may cause water environment pollution:

(1) As construction sewage contains certain amount of sand and oil in the construction process, if they are directly discharged into the pipes or randomly flow

without treatment, unfavorable impacts may be exerted on the drainage functions of the pipes and surface water environment nearby and soil may also be polluted. Thus, the construction waste water shall be simply treated according to the actual conditions and then discharged into the municipal pipes;

(2) Contractors are required to implement run-off management and control plans with sediment retention and rainwater collection channels in the construction range at each site;

(3) The living garbage, construction garbage, maintenance garbage and others shall be subject to classified collection and storage to avoid polluting the water nearby;

(4) As vehicle rinse water are few in the construction process, build cement evaporation pond, and bury and level after the construction. The solid sediment matters of vehicle rinse water shall be regularly cleared and disposed uniformly by relevant departments;

(5) In drainage design, the design unit shall guide the surface divert water into the municipal rainwater pipes according to relevant plan, and discharge them into water that receives rainwater;

(6) There are about 200 construction persons in the construction peak, who may generate about 18t/d of living sewage, including COD, animal and plant oil and others. Plan to set septic pond in the construction site, treat the living sewage through septic pond and discharge into the municipal pipes.

### 4.2.4 Sound Environment Pollution Mitigation Measures

In accordance with Tianjin Municipal Management Method for Environment Noise Pollution Control (Decree [2003] No.6 of Tianjin People's Government), the following noise control measures are proposed to reduce the impacts on the sound environment nearby:

(1) Rationally set construction site

Rational and scientific arrangement of construction site is a major route for reducing construction noise, for example, relatively centralize the fixed vibration source of the construction site to reduce the scope of impacts; temporarily place the fixed mechanical equipment such as air compressors and generators in temporary rooms and set sound isolation boards or absorption materials in the rooms.

(2) Rationally set the construction time

Under the premise that the construction progress is ensured, rationally arrange the operation time, put construction with high noise in day time (avoid the rest at

noon); for construction near kindergartens and hospitals, avoid the rest time of children and patients; during the graduation and exams of primary and junior students, the construction unit shall strictly implement the prohibited and limited regulations on noise pollution control issued by competent administration department of environment protection; and strictly limit the construction operation with high noise in night. Prohibit to engage in construction of saws, air picks, hammers and other mechanical equipment from 23:00 to 6:00 next day near the residential areas, hospitals and other sensible objectives along the roads; for construction near schools, the construction unit shall negotiate with the school party for operation of large machines to prevent from disturbing normal teaching and exams; and for construction near environment protection objectives which are relatively sensible to schools, hospitals and others, coordinate to arrange the work period and maximally shorten the construction time to reduce unfavorable impacts. For projects which require continued construction technically, the building unit and construction unit shall submit to Municipal Construction Committee and Municipal Bureau of Environment Protection for approval and record, adjust the construction time to 24-hour continuous construction, and notify the affected public for consistent negotiation, so that the construction can be started.

(3) Rationally arrange the travel routes and time of construction transport vehicles

For the construction transport vehicles, especially large transport vehicles, we shall follow provisions of relevant departments to determine the rational transport routes and time and avoid the sensible objectives such as residential centralized areas, schools, hospitals and scientific research institutes as well as periods that may cause impacts.

(4) Rationally select construction machines

The construction unit shall maximally select various construction machines with low noise and low vibration, and attach affiliate equipment with sound absorption and isolation; avoid to use many mechanical equipment with high noise in the same site

and same time; for construction mechanical equipment with high-intensity noise, set isolation shields or sound absorption barriers at one side near the sensible points to reduce the impacts of construction noise on the environment.

(5) Well promote to advocate scientific management and civilized construction

Due to the limit of technical conditions and objective environment of the construction site, the construction noise and vibration may cause certain impacts on the surrounding environment even corresponding control policies and measures are adopted. For this, we shall promote to the affected residents and relevant units along the roads; enhance scientific management in the construction site, and well educate the environment protection awareness of construction personnel; and the construction unit shall strictly follow relevant requirements of Tianjin Municipal Management Regulation for Civilized Construction and reduce the greater construction noise due to human factors.

(6) Enhance environment management and receive the environment supervision of environment protection department

To effectively control the impacts of construction noise on the urban environment, we shall implement relevant control measures and shall also enhance the environment supervision during the construction period in accordance with (17)Notice on Environment Supervision of Transport Project (Decree [2004] No. 314 of Transport and Environment of the Ministry of Transport of the People’s Republic of China); according to relevant national and local laws, decrees, orders and regulations, the construction unit shall actively accept the supervision management and inspection from the environment protection department; in engineering construction, the construction unit shall include the relevant construction noise control into the contracting contents, and set special persons to be responsible for the construction and engineering supervision to ensure to implement the control measures for construction noise.

(7) Various construction management regulations to be implemented by the construction unit

The construction unit shall carefully implement Notice on Further Enhancing the Noise Management for Construction at Night (TJ(1998) No.27), Tianjin Municipal Management Method for Control of Noise Pollution, Tianjin Management Regulation on Civilized Construction of Construction Project as well as relevant national and local provisions implemented by Tianjin government for "clean project".

(8) The operation personnel for piling machine, bulldozer, leveling machine, excavating machine and others shall be provided with ear phones and enhance self-protection.

### 4.2.5 Solid Waste Mitigation Measures

The solid wastes in the construction period include spoil generated in construction, construction garbage and living garbage of construction personnel. To further properly handle the solid wastes generated by the project, we shall follow the principle of "less amount, resource and harmlessness", and adopt the following measures:

(1) Prohibit to dispose any solid wastes in surrounding environment.

(2) Reuse the solid waste resources. Maximally use the solid wastes, and enhance the recycling of complete bricks and steel reinforcement iron in the building garbage; sort out the building garbage and crush useful waste residues to prepare into mortar for roads. The earthwork for various roads and hub projects shall be allocated to maximally reduce the amount of spoil (waste residues).

(3) For sensible points such as residential areas, schools and hospitals along the roads, well pile and transport the solid wastes, add plastic film or grass pad to cover the temporary piling field, and set water conservancy trench in surrounding areas to prevent from water and soil losses.

(4) The living garbage of construction personnel shall be collectively kept, and timely cleared and transported to urban garbage plant. The building garbage shall be timely cleared and uniformly managed by the local soil department.

As the solid wastes are distributed in linear form along the roads in the construction period, they may damage the ecological environment if they are piled improperly or not disposed timely. Thus, we shall enhance construction management, and timely clear and dispose to reduce and prevent from the impacts of solid wastes.

### 4.2.6 Ecological Environment Impact Mitigation Measures

(1) The spoil in the project shall be transported for use of other projects by transport unit selected by the construction unit and recognized by the government under the allocation of soil management department. The project has relatively large design area, so that the building unit shall entrust different construction units for construction. Due to different contents in sub-items and great difference in land acquisition, we recommend to increase relevant provisions for land acquisition and discharge when the building party signs the contract with construction units of all sections, and require the construction units to select the transport units recognized by the government to strictly transport the spoil according to the requirements of soil department and place the construction spoil at designated sites to ensure the acquire and discharge soil according to the environment protection requirements.

(2) Well rationally allocate the excavation of earthwork, and avoid the excavation during rainy period to prevent from water and soil loss due to rainwater and polluting the water body or plugging the drainage pipes. According to the relevant provisions of Tianjin Municipal Management Method for Garbage and Waste Residues, the soil management department shall uniformly arrange transport routes and avoid major residential areas.

(3) For reduction of ecological impacts, we often adopt advanced ecological design methods to reduce losses. We shall ensure to carry out the construction activities in the land scope, and maximally control to use the temporary land within the red line of planned road. We shall mainly use road foundation for construction roads, shorten the scope of construction activities, reduce the occupation of green land and enhance the protection on forests and grassland. The newly built construction camps shall be collectively placed or placed by using residential points and enterprises nearby to avoid or random or scattered placement; after the uniform disposal, the living garbage of construction personnel shall be collectively transport out of the construction site. Forbid to randomly discard them to impact the local ecological environment.

(4) Remove and transplant certain number of border trees on the two sides of roads in the construction process. The border trees are mainly poplar and willow trees rather than famous old trees requiring special protection. The plant coverage rate may be reduced and adjustment function of the ecological system may be reduced. However, the ecological impacts of plant destruction during the construction period are temporary, and will also disappear as the project ends. For temporary occupation of

land during the construction period, we must timely recover and build the ecological environment after the construction. After the construction, the new landscape area is about 66,794.58m$^2$, so that the landscape area is increased than before and the impacts of ecological environment can be effectively recovered. The urban landscaping shall be implemented strictly in accordance with relevant provisions in the construction scope, and the temporary occupation of green land shall be reported for approval and the land shall be timely recovered, and tree cur or transfer shall also be reported for approval. It is not allowed to arbitrarily cut trees, Famous and old trees or rare trees must be specially protected according to relevant requirements once they are found.

(5) The affected flowers and trees in the upgrade section shall be transplanted, optimally city area of Tianjin for survival. We shall compensate the flowers, grass and trees destroyed due to the permanent land use of project.

(6) Set flower beds and lawns as well as evergreen ornamental trees near isolation belts and buildings to compensate the reduced landscape area.

(7) To ensure the safety of construction and transport vehicles along the roads, set safety shields in the construction operation layer, and arrange safety warning lamps and indication road labels; set advertisement on isolation shields to beautify the city appearance.

(8) Remove and excavate orderly in the construction period, avoid messy landscape along the roads and set shields (such as wood, glass and iron) to reduce landscape pollution.

(9) Strictly control the scope of construction site, maximally reduce the destruction of project drainage, construction garbage, construction vehicles and personnel activities on the original plants and street fountains on the roads and reduce the negative impacts on the municipal environment and urban landscape.

#### 4.2.7 Mitigation Measures for Accumulated Impacts of Projects in the Same Period

For construction projects in the same period, we have stated the noise and dust impact mitigation measures in other special sections. In this section, we mainly offer the following three measures:

(1) Simultaneously set temporary sites, including construction camps, piling field and others, and reduce temporary land use.

(2) Mutually use the spoil generated by metro transit projects and metro projects and reduce the soil acquisition and discharge.

(3) Enhance the coordination of all construction units, and uniformly arrange the

travel routes and transport time for construction machines and construction transport vehicles to ensure the smooth and normal operation of existing roads nearby and maximally reduce the occurrence of transport accidents.

### 4.2.8 Environment Risk Mitigation Measures

The major measure for prevention of environment risks during the construction period is to enhance construction management, which specially requires:

(1) Enhance construction management and intensify responsibility awareness;

(2) Before the construction of municipal project, the construction solution must be submitted to water supply, water drainage, power supply, gas and other relevant department and can be carried out after the agreement or approval;

(3) Before the construction, carefully investigate the construction area, and clarify the municipal pipes such as existing gas, water and power. For example, more access sections shall be excavated;

(4) Carry out risk assessment on accidents, find out the types of most frequent accidents, formulate the emergency proposal for accident prevention measures and build accident emergency teams;

(5) The construction unit shall regularly organize professional personnel to evaluate the relevant personnel of the construction units and focus on assessment of environment and safety operation knowledge;

(6) Enhance the training on safety awareness, operation skills, emergency disposal methods and others of the construction personnel.

## 4.3 Environment Mitigation Measures in the Operation Period

### 4.3.1 Air Environment Impact Mitigation Measures

Major atmosphere pollutant in the operation period is the exhaust buses in the bus stations and vehicles. It is prohibited to use outdated vehicles. We shall select novel qualified vehicles with exhaust emissions that conform with the requirements on environment protection and ensure the good vehicle conditions in the operation period. The specific pollution prevention measures are as follows:

(1) To implement the spirit of Notice of the State Council for Printing Air Pollution Control Action Plan (GF (2013) No.37) and Beautiful Tianjin Construction Program of CPC Tianjin Municipal Committee and Tianjin People's Government (JDF (2013) No.19), in accordance with the requirements of Notice of National Development and Refom Commission (NDRC Price (2013) No.1845), Tianjin People's Government determines to fully supply gas oil and diesel oil that conform with the standards in the fifth stage from December 31, 2014. The upgrading of oil quality is an important measure of Tianjin for reducing air pollution, improving

ecological environment and building a beautiful Tianjin. It is investigated the sulfur content indication is dropped from 50ppm to 10 50ppm after vehicle gasoline standard is upgraded from the fourth stage to the fifth stage. Therefore, with the use in the project, the emission of CO and $NO_x$ in exhaust will be further reduced.

(2) The buses in the six districts in the city area have generally adopted the new generate oil-electric hybrid drive. The fuel conservation rate of the new generation oil electric hybrid drive buses can reach 35%, so that we recommend the operation units shall constantly improve the proportion of oil electric hybrid drive buses to further reduce the exhaust emission of vehicles.

(3) Enhance the maintenance of roads to keep the roads in good operation and reduce the traffic jam;

(4) Enhance the maintenance management of vehicles to ensure the vehicle safety and reduction of emission of harmful gases. Strictly implement the national exhaust emission standards, and forbid to drive on roads without exhaust certificate;

(5) Strictly implement the national exhaust emission standards, enhance the annual inspection, road inspection and random inspection regulation in the trail implementation, enhance the vehicle management force and control the exhaust amount of motor vehicles;

(6) Limit the tractors and loaded diesel locomotives to drive on the urban roads;

(7) Enhance vehicle maintenance to ensure the normal and safe operation of vehicles. Enhance transport management and ensure the safe and civilized drive in middle speed;

(8) Further improve the travel conditions of urban crossing s and travel conditions of transport trunks to reduce the emission of harmful materials;

(9) Encourage and support to produce and use high-quality fuel, and adopt measures to reduce the pollution of harmful substances on the environment air;

(10) Encourage to produce and use such clean energy as compressed natural gas, liquefied petroleum gas and power supply, and avoid random inspection of motor exhausts where the clean energy for new vehicles reaches discharge standard for the next stage and emission of clean energy is superior to the existing discharge standards;

(11) Enhance the landscape on the two sides of interchanged areas and roads, and plant trees and lawns such as shrubs and arbors that can absorb or adsorb the vehicle emission to control the diffusion of waste gas to the surrounding environment

and carry out landscape maintenance;

(12) Implement the environment monitoring regulation, regularly monitor the environment air quality along the roads (especially for such environment air sensible points as schools and residential areas), and build environment quality report regulation to adopt necessary measures according to the actual pollution and reduce the adverse impacts.

#### 4.3.2 Water Environment Impact Mitigation Measures

Water environment pollutants during the operation period are oily waste water generated by rinsing the floor for overhaul of buses in bus stations, living sewage of working personnel and transit passengers as well as surface runoff generated by rinsing of rainwater.

According to the design materials, all bus stations shall implement the sewage and rainwater diversion system, collect the rainwater in rainwater pipes and discharge them into municipal pipes. Set 1 septic pond and 1 oil separation in all stations, pre-treat the living sewage through the septic pond, pre-treat the oily waste water in the oil separation pond to reach the third-grade standard of Integrated Sewage Discharge Standard (GB8978-1996) and then discharge into municipal pipes.

#### 4.3.3 Sound Environment Impact Mitigation Measures

1. Sound environment impact mitigation measures for construction of bus stations

(1) Set speed limit signs at the outstanding positions in the entrances of stations or arrange speed reduction humps along the bus travel routes and strictly limit the speed for vehicles;

(2) Drive the buses strictly in accordance with the start time and allocated routes. Do not start the buses before 6:00 am, do not arbitrarily change the travel route in the station and forbid to hook horns in the bus stations;

(3) Rationally dispatch vehicles, maximally reduce the vehicle flow in the station and formulate and strictly implement corresponding regulation for overhaul and maintenance of vehicles;

(4) Enhance the traffic guidance in the stations and avoid noise due to frequent stop of vehicles;

(5) Rapidly drive away from the stations after the vehicles are started and maximally shorten the waiting and operation time in the stations;

(6) Enhance the environment education on the bus drivers and management on buses, forbid to preheat vehicles in the parking area for a long time, forbid to overhaul and test vehicles in the parking area in open field, and forbid to heat many vehicles at the same time;

(7) Strive to use hybrid power buses to significantly reduce the noise impacts of buses at the stations that exceed the standards in noise impacts on sensible points.

2. Environment protection and mitigation measures for slow travel improvement project

The noise control measures mainly consists of line adjustment, relocation, sound barrier, walls, general sound isolation windows, ventilation isolation windows, landscape noise reduction and other measures. The slow travel system for sub-items is mainly to upgrade the current roads, reduce the number of motor vehicles and add the number of non-motor roadways when the width of red line is not changed. The impact of transport noise is reduced. According to the current vehicle flow, predict the upgraded roads. For areas with many lines of buildings along the roads, the general transport noise has relatively significant impacts on the buildings in the first line along the roads, and relatively slight impacts on the buildings in the first line not along the roads. The following measures are adopted for roads and surrounding sensible points:

**(1) Relevant Noise Control Measures for Roads**

1) Upgrade the bilateral green belts of the upgraded road, and reduce the noise impact on roads and ecological impacts on roads;

2) Enhance maintenance on roads and ensure the road surface to be level;

3) Enhance the motor management and ensure the good operation status of motor vehicles on roads;

4) Forbid to toot in urban roads.

**(2) Road Management Measures**

1) Enhance road maintenance and ensure the road surface to be level to avoid the increase of transport noise due to the vehicle bumping and others caused by bad road situations;

2) Ensure the good operation status of vehicles on roads, enhance the motor management and overhaul and forbid to drive disqualified vehicles (especially the overloaded vehicles);

3) Set speed limit labels and red lamps in the areas of crossed roads or sites with many residential points, ensure the vehicles to drive at an average speed and forbid to toot;

4) Enhance the monitoring on the road transport noise, timely adopt remedies in case of excessive noise and reduce the interference of transport noise on citizens.

**(3) Control requirements for planning and construction along the line**

The site investigation shows that although the roads involved in this project are located in central city areas of Tianjin, areas to be developed still exist along some roads, i.e. in the future, new environment sensitive targets may occur along the line of roads. In order to control the negative influences of road traffic noise on construction on both sides of the roads in the future, according to comprehensive noise prediction result, this assessment proposes the following suggestions for future planning on both sides of the roads of this project:

a. According to noise prediction result, when detailed construction planning is carried out within the scope of noise influence control distance designated on both sides of route position of

this project, the first row of buildings near the street are suitable to be public architectures, commercial buildings, public green land or other non-noise sensitive buildings. And they are suitable to be set parallel to the road direction or set the noise sensitive functional areas within the buildings at the side backward the roads, in order to decrease the impact of traffic noise and play the role of sound insulation for the second row of buildings;

b. When detailed planning is carried out within the noise influence control distance on both sides of the roads, it is not appropriate to construct noise sensitive buildings in the first row of buildings near the street, such as school classrooms, hospital sickroom, bedroom of residents, institution, scientific research units and etc.

c. It is appropriate for the administrative competent planning department to define in the relevant planning documents that there should be a certain distance of interval between the noise sensitive buildings and ground transportation facilities, in order to avoid obvious disturbance of ground transportation noise on the buildings; setting of the distance can refer to the calculation results of this report and relevant approval documents of environment protection administrative competent departments.

**Table 4.3-3 Operation Noise Protection Distance of Transformed Roads (m )**

| Roads | Compartment of Acoustic Function | | | | | |
|---|---|---|---|---|---|---|
| | 1 type | | 2 type | | 3 type | |
| | Day | Night | Day | Night | Day | Night |
| Shaanxi Road（branch，12） | 65 | 132 | 28 | 53 | 14 | 24 |
| North Dagu Road（sub-arterial road，12） | 155 | 294 | 63 | 130 | 27 | 52 |
| An’shan Road（sub-arterial road，16） | 218 | 392 | 92 | 184 | 38 | 76 |
| Baoding Road（sub-arterial road，24） | 160 | 301 | 65 | 133 | 28 | 55 |
| Beicheng Street（sub-arterial road，30） | 277 | 481 | 121 | 237 | 50 | 102 |
| Heping Road（sub-arterial road，36） | 357 | 597 | 165 | 307 | 69 | 137 |
| Rongye Street（arterial road，30） | 319 | 541 | 142 | 273 | 58 | 120 |
| Fu’an Street（Arterial road，36） | 464 | 749 | 228 | 408 | 98 | 194 |
| Nanmenwai Street（arterial road，50） | 503 | 792 | 248 | 439 | 108 | 209 |

### 4.3.4 Environment Impact Mitigation Measures for Solid Wastes

In operation period, regarding to the household garbage produced by each public transport station, concentrated stacking places are set within the stations. The environment sanitation department in the district of the project carries out clearance and transfer for the garbage regularly. And it will transfer the garbage to the household garbage disposal plant or specified location for

concentrated disposal**.**

The waste oils produced by the public transport station is dangerous solid wastes (belong to HW08 used mineral oil). Measures in the following aspects should be taken:

① In the maintenance process of autos, preventive measures for sprinkle, leakage and drip of engine oil and waste oil collection measures should be carried out carefully. Seepage-proofing and oil absorption measures should be adopted for ground surface of maintenance workshop; vessels such as steel barrel, steel can or plastic products should be adopted for holding. The adopted vessels or tanks which are full and will be carried away must be marked explicitly with the types and hazard statement of the content and quantity and the date of filling. Set identification marks for dangerous wastes. ③ The "quintuplet voucher " system for transfer of dangerous wastes should be adopted, in order to ensure the transport safety, prevent illegal transfer and illegal disposal and ensure safety monitor of dangerous wastes and prevent occurrence of dangerous waste pollution accidents. The wastes should be delivered to units with qualifications for disposal of relevant dangerous wastes for disposal.

### 4.3.5 Ecological Impact Mitigation Measures

If the original lane separators and trees on the sidewalks are damaged because of widening of the roads, these trees should be replanted in other places and their survival should be ensured; After the roads are constructed, plant trees and grass at intersections or other open space. Flower beds, lawn and evergreen ornamental trees should be set in space near the buildings. For the decreased areas of green land due to construction of the project, they can be recovered in other places within the city, so that the total green area will be increased. According to "*Standard of Urban Road Greening Construction of Tianjin*", the greening rate of roads with planning red line of 40~50 m width should be no less than 25%. The greening rate of roads with planning red line below 40 m width should be no less than 20%.

Setting appropriate sculptures, greening articles, artistic and practical garbage bins, seats and etc at intersections, sides of streets and open spaces among buildings can not only improve the city environment and beautify the road landscape, but also can improve the artistry of the city, increase the affinity of the city and provide fields for urban residents to stroll about or have a rest. The road greening work of some road sections may need to be implemented step by step. Construction unit should consider in long term, such as reserve spaces for planting trees when the sidewalks are constructed in order to decrease repeated excavation and construction of the same road section.

## 4.4 Communication and Persistent Public Participation

In the construction period of the project, communication and negotiation with the public is a persistent work, which is mainly implemented through the following measures:

1) Conspicuous sign boards should be set in all the project sites, which state the project information including brief description of the project, construction period, main construction activities, name and telephone number project manager and name and telephone of chief inspecting engineer. In addition, invite the public to provide their own site management staffs in their concerned areas.

2) It is required that each contractor convenes public meeting in the neighborhood committees of their construction sites. The meeting should be convened at least once each year. On the meeting, the site management staff explains the construction activities and gets to know the concerns of the residents and responses to them.

3) The project office needs to arrange a full-time safety staff to receive complaints from the public for construction and operation. The names and telephone numbers of project office members are informed to the local public through manuals and public meeting.

4) The project office and contractor can visit the key environment sensitive points such as school and residential areas and get to know their concerns and their feeling for the construction and operation and the caused impact.

5) When preparation is made for special or influential construction activities, such as inevitable night construction, it is required that the contractor visits the potentially impacted communities to explain their activities and the caused impacts (such as safety risks and high noise and etc). The contractor should listen to the public about their concerned content and adopt appropriate and responsible measures to solve their concerned problems.

# Chapter V Site Environment Supervision

## 5.1 Requirements of law and contract

The contractor makes detailed environment protection implementation plan aiming at each site specifically in the bidding document. The plan and the articles relevant with environment protection in the construction contract must meet the requirements of relevant environmental protection laws and regulations of the country.

The construction organizing plan of the contractor must be submitted to CSE for approval. CSE will check whether it includes sufficient environment protection and pollution control measures. The contractor will submit relevant documents such as project progress report and updated project plan to CSE, in order to ensure the smooth implementation of inspection work of CSE. The site log needs to be recorded according to requirements of CSE and submitted to CSE for inspection at any time.

In the inspected documents, if any content which doesn't conform to requirements about environment protection and pollution prevention of contract and law is included, CSE will provide explicit correction opinions for the contractor. The contractor must correct them immediately. Otherwise, CSE will refuse to issue the construction permit.

## 5.2 Site supervision

Through regular site inspection and monitor of construction activities, CSE confirms the potential environmental problems which possibly exist and propose timely relieving (preventing) measures for the contractors. The inspected areas include the construction areas and direct or indirect influences of the project construction on areas outside the construction areas.

The regular site inspections (such as weekly or monthly inspection) are organized by CSE. And CET and PMO participate in the inspections. CSE should record the environment change situation in the project construction process and the environment duty performance situation of the contractors in the work log. Such work log may influence violation behaviors of environment impact assessment and

suggestions of "Environment Impact Plan" report or project contract. Such work log should be provided for contractors and relevant staffs about implementation of "Environment Impact Plan" and external monitor and consulting counselors.

When CSE carries out guidance and inspections, the following information will be involved:

1) Environmental performance of contractors, environmental protection implementation plan, decrease of wastes, management of dangerous wastes and implementation situation of other required relieving measures;

2) Environment relieving measures provided in Appendix A of this "*Environment Management Plan*";

3) Meet the requirements of environment management plan, contract regulations and relevant laws, regulations, technical standards and criterion of People's Republic of China;

4) Protection of sensitive regions and management mechanism of restricted regions;

5) Construction methods of the contractors and conditions of the construction sites;

6) Construction scheme of single project including relevant measures and suggestions for pollution control;

7) Project progress and construction procedure;

8) The sufficiency and effectiveness of the pollution control measures (disposal facilities) of the contractors to minimize the environmental influence;

9) Location, management and pollution control measures of wastes, material storage areas, land borrowing field and construction road.

10) Problems and results found in previous site inspections.

The contractor updates all the information relevant with construction contract for CSE, which will be provided for CSE to implement site inspection. The inspection results and suggestions for optimization of relevant environmental protection measures will be submitted to the contractors timely for correction. If violation behaviors or disjointing phenomenon occurs or the environment quality standard is exceeded, contractors should adopt correcting measures according to requirements in the document. The contractor will implement the measures according to procedure and time limit specified by CSE and report any following remedial measures.

After weekly (monthly) inspection, a meeting will be organized. During this period, the contractor will report the implementation and progress situations of the correcting measures confirmed in the previous inspections. During the current inspection period, discuss the confirmed investigation result and required correcting measures. The minutes of the meeting will be distributed to all attendees. And it is required that the contractor should implement necessary measures within the agreed time.

## 5.3 Punishment system

According to the contract, if CSE finds behaviors violating the environmental laws and regulations during the site supervision period, the contractor should complete correction within specified time (for example, 2 weeks). If the contractor

completes the correction within the specified time, the contractor can be exempted from the punishment. If the contractor fails to carry out necessary correction within the specified period, the contractor should pay money to the third party and the third party will complete the correcting measures on behalf of the contractor.

### 5.4 Environment complaints

In the construction process, if environment complaints are received, CSE will start the complaint investigation procedure. CSE will carry out the following procedures according to the received complaints:

1) Include the complains and the date of receiving the complaints to the complaint database and inform the contractor;

2) Investigate the complaints to confirm its effectiveness. And evaluate whether the sources of the problems are originated from the project activities.

3) If the complaint is effective and it is caused by the project activities, relieving measures should be made. And inform the contractor;

4) If the complaints are transferred from the Environment Protection Agency, submit the temporary report of relevant complaint investigations to the Environment Protection Agency and the Environment Protection Agency will take actions of the next step within the specified time limit;

5) Carry out further inspection, verify the situation and adopt measures to ensure that the complaint will not occur any more;

6) Report the investigation result and the afterwards actions taken for the complainants according to the complaints. (if the complaints are from Environment Protection Agency, the result will be reported within the time limit specified by the Environment Protection Agency);

7) Record the results of complaints, investigations, afterwards actions and monthly environment management plan report.

During the complaint investigation period, the contractor cooperates with CSE and provides all necessary information to help CSE complete the investigation. If the relieving measures have been confirmed in the investigation, the contractor should implement the relieving measures fast. CSE will ensue that the contractor will implement these measures.

## Chapter VI Environmental Monitoring Plan

### 6.1 Overview

In the project implementation stage, the proprietors will engage environmental monitoring consultant (EMC) of environment management plan. Such EMC will collect relevant indexes of environmental sensitive points (including water, air, sound and etc) regularly. Such indexes will be submitted to the proprietors, which will be used as the reference basis for judging the compliance of environment laws and regulations. Reasonable monitoring plan will be formulated, which will help to evaluate the overall performance of the project engineering and the short-term

influences caused by the construction activities.

As important constituent part of EMP, environment monitor plan includes the following content:

1) Confirm the predicted negative influence in EIA;

2) Confirm the actual scope of influence;

3) Evaluate the effect of relieving measures implanted on sites;

4) Identify and adjust the additional relieving measures adopted for abrupt influences. These measures are possibly necessary during the construction and operation period of the project.

## 6.2 Environmental monitoring

Regarding to influence monitor in construction period of the project, the external monitor consultant (EMC) of environment management plan carries out regular environmental monitor. In peak period of the construction or upon requirements of proprietors, EMC also needs to use portable equipment to monitor short-term influences. Once it is confirmed that behaviors violating environment quality and performance standard exist, additional influence monitor needs to be implemented.

According to the predict outcomes in the environment influence report of the project, take the sensitive points which may produce obvious pollution as the monitoring points and track and monitor the pollution situation in the construction period and operation period of the project. Regarding to the monitoring content, select noise, air environment and surface water environment, which have relatively greater influence on environment. The monitor factors are determined according to characteristic factors of the project pollution.

Regarding to monitor analysis methods, the monitor analysis methods for corresponding projects in "Technical Specifications of Environmental Monitor" issued by original State Environment Protection Agency are adopted. Regarding to evaluation standard, the standard confirmed in the environment influence report will be executed. According to the project characteristics of Urban Transport Improvement Project of Tianjin, staged environmental monitor schemes will be made according to the construction period and operation period as shown in Table 6.2-1.

**Table 6.2-1 Environmental Monitor Plan**

| Stage | | Monitor Location | Monitor Items | Monitor Frequency | | Monitor Duration | Implementation Unit |
|---|---|---|---|---|---|---|---|
| Construction Period | Environment air | Temporary storage sites for solid waste and periphery of environment protection targets long the line | TSP、$PM_{10}$ | Once each quarter（Densify the monitor according to the circumstances in the construction peak） | | 3-4 times each time | EMC |
| | Noise | Periphery of environment protection targets long the line | LAeq | Once each quarter | 2 days | One time in the day and one time at night | |

| Stage | | Monitor Location | Monitor Items | Monitor Frequency | | Monitor Duration | Implementation Unit |
|---|---|---|---|---|---|---|---|
| Operation Period | Environment air | Environment protection targets long the line | CO、$NO_x$ | 1 time/year | 1 day | 18-hour successive supervision | Local environment monitoring station entrusted by proprietors |
| | Noise | Environment protection targets long the line | LAeq | 1 time/year | 2 days | One time in the day and one time at night | |
| | Waste water | 5 discharge outlets of bus stations | pH , $NH_3$ –N, COD , $BOD_5$ , petroleum and etc | 1 time/year | | | |

In addition, both the contractor and supervising engineer will carry out environmental monitoring according to content specified by the contract: use the portable monitoring equipment to monitor the noise level of the environmental sensitive points; carry out monitoring during the period of heavy construction activity, such as excavation, piling, power generation, material transportation and construction at night. Monitor the noise level near the environmental sensitive points surround the construction site and along the roads.

The result will be included in normal written report and submitted to PMO.

## 6.3 Monitoring equipment and records

The equipment and testing methods adopted by the construction unit and supervision unit in monitor of the project should conform to relevant regulations and relevant environmental quality standards. The monitoring equipment should be calibrated regularly. And calibration of the equipment is carried out before site measurement. All the calibration records will be submitted to EMC. EMC will save all the site records, report and relevant approval documents.

If it is necessary, any changes of monitoring equipment and monitoring methods need to be approved by EMC in advance. During the period of site supervision and inquiry, to provide convenience for acquisition, it needs to carry out data record at possible places. Table 6.3-1 specifies the records which should be kept in EMC offices of each site.

**Table 6.3-1 Typical Environment Records Saved in Construction Period**

| **Type** | **Record** |
|---|---|
| Total | 1) Environment training record (such as attendance record of environment consciousness training and discussion meeting);<br>2) Site log and site inspection record;<br>3) Environment work log book, complaint work log book and notification form for standard-exceeding of environment quality restriction; |

| Type | Record |
|---|---|
| | 4) Construction procedure and progress plan;<br>5) Equipment maintenance and repair record;<br>6) Contact with interested parties and other parties of the environment problems;<br>7) Minutes of the meeting. |
| Noise control | 1) Update the current electromechanical equipment list on sites ;<br>2) If any environmental sensitive points are influenced, periodic inspection should be carried out and detailed materials of the inspection results should be provided. |
| Water pollution control | 1) Drainage plan on the construction site;<br>2) Record reuse of the collected waste inflated mud and quantity of the repaired and disposed drilling mud;<br>3) Record maintenance and clearance of sediment and petroleum/grease；<br>4）Record toilet sewage disposal (without connecting the existing sewage main pipe);<br>5) Record of final discharge quality of waster water and pollutant concentration. |
| Management of solid wastes | 1) Backup the relevant valid certificates of waste transport vehicles and waste collectors in the environment management plan;<br>2) Record quantity of reused and regenerative wastes;<br>3) Record the quantity of inert wastes transferred into site active substance (if any) |
| Atmosphere | 1) Drainage plan on the construction site;<br>2) Routing and scheme of building material transportation;<br>3) Relieving measures relevant with air effect, such as watering;<br>4) Monitoring result of air quality. |
| Ecological resource | Record locations of sensitive ecological resources and relevant protection plan. |

# Chapter VII Staff Training

Smooth execution of various environment management activities in this "*Environment Management Plan*" depends on knowledge and experience of environment management staffs. The new methods of environment management in content of projects such as road construction, public transport and intelligent transport are new things for the local departments and organizations. Therefore, training needs to be carried out widely. The domestic and oversea training provides the plan for the interested parties of the project. Oversea training will be carried out in countries with abundant experience of road construction and operation management. Domestic training is guided by experts from universities, research institutions and professional consulting organizations.

Concluding experience of the following projects, it is necessary to improve the environment protection consciousness of construction unit and supervision unit. At the same time, the environment protection consciousness needs to be improved and the supervision over management authority should be enhanced. It is necessary to provide training courses to improve their environment protection consciousness.

Staff training includes environment laws and regulations, standards, responsibilities, management methods and etc. See Table 7-1 for the detailed content of staff training.

| **Type** | **Characteristics** | **Staff** | **Training Content** | **Number of Persons** | **Time** | **Date（Year）** | **Expense（10 thousand Yuan）** |
|---|---|---|---|---|---|---|---|
| Oversea | Environment management | Relevant department management staffs of project coordination office | Advanced experience and best practice of environment management in construction period | 6 | 10 day | 2014 | 16 |
| | | Project management office, professional staffs of proprietors' unit | Environment management technologies and methods in construction period | 20 | 14 day | 2015 | 40 |
| Domestic | Environment protection | Environment staffs of construction units | Environment basic theories and supervising methods, supervising report, position | 10～20 | 4 day/time | 2014 -2017 | 8.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | training<br>Once each year:<br>Environment management plan<br>Environment monitor and report<br>Contingency plan | | | | |
| | Supervision | Environment protection supervising engineer, environment management staff of construction party | Environment protection law and regulation, construction planning, environment monitor criterion and planning, environment air monitor and control technology, noise monitor and control technology | 5～10 | 5 day/time | 2014 -2017 | 5.5 |
| **Total** | | | | | | | **70** |

# Chapter VIII Reporting

## 8.1 Submission of contractor project document

According to requirements of the bidding documents, before starting the construction, the contractor compiles "*Environment Management Implementation Plan*" for this project engineering. This plan should be submitted to the construction supervising unit (CSE) for review, in order to make it conform to relevant laws, regulations and requirements of the approved "*Environment Impact Report*" and "*Environment Management Plan*". Any changes of the submitted documents should be reviewed and approved by the representatives of construction supervising engineers. The "*Environment Management Implementation Plan*" approved by the supervising engineer will be submitted to EMC for inspection. If EMC has any additional suggestions, they will feedback to the contractor through supervising engineer. Relevant documents will be updated regularly.

## 8.2 Environment management plan report

The inspection results and relevant suggestions of all environment management plan report work required in the project will be recorded in the quarterly (half-year, annual) environment management report prepared by MEC. If it is necessary, MEC will prepare concise monthly report, especially when violation behaviors occur. The environment management implementation plan report will be submitted within two weeks after each report period. The first phase progress report will be submitted within the first month after the construction starts.

The quarterly (half-year, annual) environment management report at least includes the following content:

(a) 1-2 pages of execution conclusion

1) situation of violation of environment protection regulations;

2) Complaint record;

3) Report changes;

4) Key problems in the future.

(b) Basic project information

1) Project organizations, including names and contact telephone numbers of key staffs

2) Construction procedure;

3) Management structure;

4)Work needs to be completed in this quarter.

(c) Environment situation

1) Graphic illustration of work carried out in the quarter (such as project location and activities);

2) Graphical representation of locations of project areas, any environmental sensitive points and monitor stations.

(d) Conclusion required by the environment management plan

1) All monitor parameters;

2) Environment conformance level

3) Environment evaluation report of this project and execution situation of environment relieving measures recommended by environment management plan;

4) Requirements for the environment in the contract documents.

(e) Implementation situation

Suggestions for implementation situation of environment protection measures and pollution prevention and relieving measures, such as what recommended by the environment evaluation report and environment management plan of this project. They will be concluded in implementation plan.

(f) Monitor result

Provide monitor result and following information:

1) Monitor method

2) Name of laboratory: device type and calibration details

3) Monitor parameters;

4) Monitor location (and depth);

5) Monitor date, time, frequency and time limit;

6) Monitor the weather situation during the period;

7) Any other factors which are possible to influence the monitor result;

8) Quality assurance, quality control result and monitor restriction.

(g) Report violation behaviors, complaints, notifications and etc

1) Records of all inconformity (exceeding standard) of environment quality performance;

2) Record all the received complaints (in written form or oral form), including location and property of complaint investigation, adopted contact and consulting methods, actions and follow-up procedures, results and conclusions;

3) Record all the behaviors violating the local environment protection laws.

(h) Other

1) Introduction about inspection of key factors in the future from the work plan and work method announcement.

2) Suggestions for management situations of noise, atmosphere, water and solid wastes.

## 8.3 Data Records

Generally speaking, site documents such as site original monitor record, laboratory analysis record, video, pictures needn't to be included in the submitted quarterly environment management plan report. However, the document will be kept by CSE of the proprietors so that it can be submitted at any time. All the relevant information will be recorded in the document explicitly and systematically.

The monitor data also needs to adopt electronic records. All the documents and materials will be stored in the construction period of the project. And within one year after the project is completed, if the proprietors have needs, they can acquire the relevant materials at any time.

# Chapter IX Environment Management Plan Budget

Environment management expense estimation includes environment facility expense, monitor expenses, training expenses and external monitor consulting service fee of environment management plan. All the expenses have been included in the total investment estimation of this project.

## 9.1 Environment investment estimation

The total investment of the project is estimated to be 1,428,000,000 yuan. The environment protection investment includes expenses of environment protection facilities, equipment, environment monitor in construction period and etc. According to the environment protection countermeasures in this report, the initial estimation of one-off engineering environment protection investment of this project is 27.09 million Yuan. The environment protection investment accounts for 2.6% of the total investment of the project. Among them, 21,335,200 Yuan are listed in project investment. And newly added environment protection investment is 6,758,500 Yuan. See Table 9.1-1 for environment protection investment.

**Table 9.1-1 Investment Estimation of Environment Protection Measures**

| Time Period | Content | | Investment | |
|---|---|---|---|---|
| | | | Estimation | Total |
| Construction Period | Social environment | Investigations of overground and underground pipelines | 150 | 198 |
| | | Media information | 4 | |
| | | Billboard of construction site | 4 | |
| | | Temporary substitute facilities of power and gas pipelines and etc | 40 | |
| | Ecological measures | Stacking and maintenance of earth acquiring and spoil bank. | 10 | 90 |
| | | Replanted plants and trees transplantation and etc | 40 | |
| | | Ecological recovery of earth acquiring stations | 40 | |
| | Atmosphere | Hardening treatment of construction site | 30 | 112 |
| | | Clean the wheel | 10 | |
| | | Watering system | 30 | |
| | | Complete enclosure on construction site | 40 | |
| | | Monitor | 2 | |
| | Noise vibration | Noise prevention such as equipment noise elimination | 100 | 102 |
| | | Monitor | 2 | |
| | Sewage | Simple disposal of sanitary sewage in construction period | 4 | 14 |
| | | Disposal of waste water from vehicle washing | 10 | |
| | Solid waste | Project spoil earth disposal | 10 | 20 |

| | | | | |
|---|---|---|---|---|
| | | Disposal of household garbage | 10 | |
| | Total | | — | 536 |
| Operation Period | Ecological compensation | Greening measures such as replanted flowers, grass and trees | 800 | 820 |
| | | City sculpture and furniture | 20 | |
| | Atmosphere | Road maintenance | 50 | 52 |
| | | Monitor | 2 | |
| | Noise | Noise prevention such as sound insulation window | 1294 | 1296 |
| | | Monitor | 2 | |
| | Total | | — | 2168 |
| Training of environment protection technical staffs | | | 5 | 5 |
| Total | | | — | 2709 |

| Time Period | Content | | Investment | |
|---|---|---|---|---|
| | | | Estimation | Total |
| Construction Period | Social | Investigations of overground and underground pipelines | 150 | 198 |
| | | Media information | 4 | |
| | | Billboard of construction site | 4 | |
| | | Temporary substitute facilities of power and gas pipelines and etc | 40 | |
| | Ecological measures | Stacking and maintenance of earth acquiring and spoil bank. | 10 | 90 |
| | | Replanted plants and trees transplantation and etc | 40 | |
| | | Ecological recovery of earth acquiring stations | 40 | |
| | Atmosphere | Hardening treatment of construction site | 30 | 112 |
| | | Clean the wheel | 10 | |
| | | Watering system | 30 | |
| | | Complete enclosure on construction site | 40 | |
| | | Monitor | 2 | |
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| | Solid waste | Project spoil earth disposal | 10 | 20 |
| | | Disposal of household garbage | 10 | |
| | Total | | — | 536 |
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| | | | | |
|---|---|---|---|---|
| | on | City sculpture and furniture | 20 | |
| | Atmosphere | Road maintenance | 50 | 52 |
| | | Monitor | 2 | |
| | Noise | Noise prevention such as sound insulation window | 1294 | 1296 |
| | | Monitor | 2 | |
| | Total | | — | 2168 |
| Training of environment protection technical staffs | | | 5 | 5 |
| Total | | | — | 2709 |

## 9.2 Annual operation expenses of environment protection facilities

The operation fees of environment protection facility in the first three years of operation period are included in World Bank loan. Post-period operation fees of environment protection facility are included in the fees of company operation. The operation fees of environment protection facilities of this report are considered as three years and 0.93 million Yuan in total. See Table **9.2-2** for details.

**Table 9.2-2 Annual Operation Fees of Environment Protection Facilities**

| Serial No. | Project | Fees（10 thousand Yuan） | Remarks |
|---|---|---|---|
| 1 | Environment monitor expenses in operation period | 6 | |
| 2 | Device energy consumption | 1 | |
| 3 | Maintenance and updating of environment protection facilities | 20 | Sewage treatment facility, solid waste collection system and etc. |
| 4 | Wages and service fees of facility maintenance staffs | 4 | |
| Subtotal | | 31 | |
| Total in operation period | | 93 | 3 years |

# Appendix A: Environment Regulations of Technical Specifications of Bidding Documents of Building Project

This appendix will be used as the important component content of Part I "*Technical Specifications*" of Chapter 6 Proprietor Requirements of "*Domestic Competitive Bidding Document of Building Project*". The contractors should perform their environment responsibilities strictly and implement the relieving measures in approved environment evaluation document, which will be used as one of the basis for application to the proprietor for payment. Refer to technical specifications to compile convention. The first chapter of technical specifications is often composed of 11 sections such as project overview, bidding scope, application standard, project boundary, condition and materials provided by proprietor, condition and material provided by bidder, contract management, enter and exit the site, equipment and material, temporary project and environment protection and safe and civilized construction. This appendix will be content of the section 1.11. This number will be adjusted correspondingly according to the finally compiled bidding document of the project. The relieving measures stated in this appendix are applicable to construction activities of each sub-items of Tianjin urban transport project using World Bank Loan, including but not restricted to urban roads, construction of public transport station, metro transit engineering and etc.

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
|---|---|---|---|
| 1.11.1 | **Early-stage preparation of the construction** | - | 1) According to requirements of contract articles, define special staffs for environment management;<br>2) Participate the environment management training organized by proprietors for contractors. |
| 1.11.2 | **Social influence** | | 1) Set billboard at entrance of the construction site and states the project contractor, construction supervision unit, construction period and hot line telephone number and names of contact persons of local Environment Protection Agency. Strive for understanding and sympathy of the influenced masses for the temporary disturbance caused by the project construction. At the same time, provide convenience for the influenced masses to contact with concerned department when violation operation of the construction unit is found; |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
|---|---|---|---|
| | | | 2) Set explicit traffic dispersion indicating plate. In the peak period of construction on busy roads, propose suggested transport dispersion scheme and submit the scheme to the proprietor. And the proprietor will submit it to relevant department for implementation;<br>3) Decrease the influence of construction on public service as possible. If the influence is inevitable, it should be reported to the proprietor in advance. The proprietor will inform the residents. And shorten the time of influence as possible.<br>4) Once the construction unit finds historical relic in the construction process, stop the construction immediately. Protect the site and report it to the historical relic management department;<br>5) Establish effective statement mechanism. The contractors should be received by special staffs;<br>6) Upon requirements of the proprietor, the contractor participates in the public participation meeting convened regularly in the village of influenced area of the project. On the meeting, construction unit appoints staffs to explain the construction activities and the environment protection measures which have been adopted or will be adopted. And they listen to the concerned environment problems and complaints of the public and reply to the public.<br>7) Generally speaking, the equipment producing vibration also produces noise at the same time. Because vibration spreads in earth medium, its rate of decay is higher than that of noise. Therefore, for vibration, the vibration protection distance of a device is smaller than the noise protection distance of the same device. Therefore, noise protection and relieving measures are also applicable to vibration. When the noise control measures are implemented, the influence of vibration on environment will also be controlled. |
| 1.11.3 | Air quality | Construction fugitive dust | (1) Formulate and implement work scheme for abatement of fugitive dust in construction site. Include the fugitive dust pollution control situation in the construction into the credit management system of construction enterprises as important basis for bidding; the construction site of each project should set signboards and |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
|---|---|---|---|
| | | | environment protection measure signboards stating explicitly the name of construction unit of the project, name and contact telephone of responsible person of the project, planned completion date, approval number of construction permit.<br>(2) All the construction sites adopt strictly engineering measures such as sealing, high hurdle enclosure, spraying and etc. Excepting the field of working plane, hardening treatment must be carried out within the site. Coverage or greening must be carried out for all other sites. The earthwork should be stacked concentratedly and measures such as coverage or solidification should be adopted; There must be environment protection measures for preventing pollution caused by leakage and sprinkle in the construction scheme of the construction project. And operation specification for preventing fugitive dust should be compiled.<br>(3) Enclosures are set in the construction site to separate the construction site from the external world. The setting height, material selection, setting of exit and entrance and width of the enclosure should meet relevant regulations; At the same time, measures such as simple greening must be carried out for the open spaces which will not developed temporarily;<br>(4) The exit and entrance of construction site should avoid causing influences on regional traffic as possible. At the same time, set vehicle washing facilities at the entrance and exit of the construction site. Appoint special staffs to wash the wheels and sides of vehicles and clean the entrance and exit. Ensure that the vehicles won't bring mud to roads. And adhere to civilized loading and unloading in vehicle transportation.<br>(5) The construction site of construction project must establish watering and cleaning system and appoint special staffs to be responsible for watering and cleaning, which should be carried out at least twice each day (go on duty and come off duty ); in addition, working procedure such as reshipment of bulk materials and transportation cause large quality of fugitive dust, so they should be carried out under whether condition without heavy wind. In strong wind weather with level 4 wind and above, it is forbidden to carry out operation which will cause large quantity of fugitive dusts.<br>（ (6) The construction site should be kept clean. The engineering spoil land should be cleared timely. The pedestrian channel should be kept clean, smooth and unblocked; For the earthwork operation which is dry and easily to cause dust, carry out dust suppression through watering. And shorten time of dust-raising operation as possible.<br>(7) Keep the carriages carrying spoil earth and building materials complete. In loading, the carriage shouldn't be too full. Keep normal driving speed, in order to prevent dripping and sprinkle in the process of transportation. All the transport objects should be covered by tarpaulin. |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
|---|---|---|---|
| | | | (8) Plan the roads for construction transportation vehicles reasonably and drive according to specified routes; special staffs should be appointed to be responsible for cleaning mud and earth scattering on the roads, which should be cleared out timely. For road sections with high environment requirements, select to transport at night according to actual situation, in order to decrease the influence of dust on environment; the transport method should be adjusted according to the local condition. Adopt large-tonnage autodumpers and mechanized loading as possible to decrease the transit links and forbid overload transport.<br>(9) Inspection and monitor should be carried out regularly for construction fugitive dust, construction machinery and exhaust gas discharged by construction transport vehicles; forbid strictly to use oil of low quality. Enhance maintenance of mechanism and make power fuel burn sufficiently to decrease emission of exhaust gas.<br>(10) This project must adopt commodity bituminous concrete completely. At the same time, it is strictly forbidden to burn any wastes and substances which produce poison and harmful gas, smoke and bad smell on the construction site. Sealed devices should be used for storage and loading of poison substances such as melting bitumen; If canteen is set in the construction site, clean energy should be used. It is forbidden to use coal brick kitchen range or use materials such as timber, felt and oil paint as combustion energy.<br>(11) In construction process, it is forbidden to stack cement and lime in open air. Decrease slaking of lime, mixing of dust or other operation causing serious dust pollution on site; It is strictly forbidden to use the discarded building materials as fuel for burning. After the construction is completed, recover the surface road and plants for the site occupied for construction timely.<br>(12) According to relevant requirements of "Notice of General Office of Tianjin People's Government on Transmitting the Management Methods of Abating Fugitive Dusts Caused by House Demolition of Tianjin", for demolition of house, enclosure should be carried out according to relevant regulations of the city to avoid spillover of muck; When the houses are demolished and the engineering muck is cleared, dust suppression should be carried out through watering and spraying. It is forbidden to cause fugitive dust pollution; On the construction site of house demolition, comprehensive measures such as high hurdle enclosure and spraying are implemented to prevent fugitive pollution. The garbage and muck of the demolition should be cleared timely. For those can't be cleared temporarily, storage field should be set. And dust prevention measures such as coverage and watering are adopted; When wind above level 5 (including level 5)occurs, the construction operation of house demolition should be stopped.<br>(13) Enhance management and carry out management responsibility system. Advocate civilized construction. |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
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| | | | Expenses of safety and civilized construction measures must be set. And ensure that the fund is used for its specified purpose only; refer to relevant requirements of "Technical Specifications for Preventing City Fugitive Dust Pollution" (HJ/T393-2007) for technical details of specific implementation of fugitive dust prevention measures.<br>(14) Implement Tianjin contingency plan for heavy pollution weather. According to requirements of contingency plan and early warning level of heavy pollution weather, implement lockout measures for construction site. |
| 1.11.4 | Noise | Construction noise | 1) Enhance noise monitor. In construction site, noise reduction measures should be made according to requirements of the national standard "Environment Noise Emission Standard of Building Construction Site" （GB12523-2011）. Carry out testing and record for site noise on the construction site. The noise emission shall not exceed the national standard.<br>2) Adopt low-noise machinery. For construction mechanical equipment adopted in project construction, noise measurement under normal work status should be carried out for them in advance. The machinery exceeding national standard are forbidden to enter the site for construction; In the construction process, maintenance for equipment should be often carried out, in order to avoid increase of noise caused by poor equipment performance; The vehicles transporting materials are forbidden to whistle in the construction site. The materials should be handled gently in loading and unloading.<br>3) The site for entering and exiting of the construction transport vehicles should be arranged at the side which is far from sensitive points such as residential areas and schools. The strong noise equipment in the construction site should be set at the side far from the residential area. Measures such as sealing of the strong noise equipment can be adopted for reducing the noise.<br>4) In the construction process, maintenance of the equipment should be carried out frequently.<br>5) The construction unit should arrange the operation time and construction site reasonably. Construction in road section with sensitive points should adjust the construction time according to situations. Night (22:00~6:00) construction work of high noise machinery is forbidden; For the work points which must carry out construction operation successively, the construction unit should contact with environment protection department timely according to specific situation and apply for night construction certificate according to the regulations. At the same time, the construction unit should issue announcement and |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
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| | | | strive for support of the public to the maximum degree; And in night construction, high noise machinery should be avoided. If it is necessary, set temporary sound boarding.<br>(6) Carry out construction management of sensitive road sections well. Control the operation speed of mechanical equipment such as bulldozer, navvy, road roller and etc; The vehicles transporting materials should control the vehicle speed (the speed per hour doesn't exceed 8 kilometers) when they enter the construction site. It is forbidden strictly to whistle. |
| 1.11.5 | Water Quality | Sanitary sewage and construction sewage in construction area | (1) The construction sewage in the construction process of the project contains a certain quality of silts and oils. If it is discharged into the sewer or flows randomly without processing, negative influences on drainage function of the sewer and nearby surface water environment will be caused. And soil pollution may be also caused. Therefore, the construction sewage should be discharged into municipal pipeline network after it is processed simply according to the actual situation;<br>(2) It is suggested to construct respectively the rainwater guidance canal and filtering and sedimentation basin within the construction scope;<br>(3) For wastes such as household garbage, construction garbage and maintenance garbage, classified collection and storage should be adopted in order to prevent the wastes from entering the nearby water bodies and causing water quality pollution;<br>(4) In the construction process, the produced vehicle washing water is of relatively small quantity. Cement evaporation pool can be constructed. After the construction is completed, bury it and smooth it with earth. The solid content of the vehicle washing water after sediment should be cleared regularly, which should be cleared, transported and disposed collectively by concerned department;<br>(5) Design unit should lead the road runoff water into the urban rainwater pipe network according to relevant planning and discharged it into the water bodies planned to accept rainwater; |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
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| | | | (6) In the construction peak period of the project, there are about 200 construction staffs. The production volume of sanitary sewage is about 18t/d. The quantity of sanitary sewage is relatively small. The main pollutants are COD, animal and vegetable oil, SS and etc. The project construction plans to set septic-tank in construction camps. The sanitary sewage is discharged into municipal pipe network after it is processed by the septic-tank. |
| 1.11.6 | Solid wastes | Household garbage and construction waste earth and waste materials of construction area | (1) It is strictly forbidden to discard any solid wastes in the surrounding environment randomly.<br>(2) Carry out recycle of solid waste resource well. The solid wastes of this project should be recycled and reused as possible. For complete bricks and scrap iron of rebars among the building garbage, recycling should be enhanced; Sort out the building garbage and then smash useful waste residues into mortar, which can be used for constructing roads. Carry out deployment and utilization each roads and pivotal project which excavating earthwork in order to decrease the quantity of spoil land and waste slags produced by construction of the project.<br>(3) If there are sensitive points such as residential areas, schools and hospitals along the line, carry out stacking and transport of the solid wastes carefully. The temporary stacking site should be covered by plastic films or petate. Set water-saving ditch in periphery, in order to prevent water and soil loss.<br>(4) The household garbage produced by construction staffs should be stacked collectively and cleared and transported to city garbage disposal plant. The building garbage should be cleared and transported timely, which will be managed collectively by the local residue earth department. |
| 1.11.7 | Ecology | Vegetation deterioration reduction influence | (1) The spoil land involved in this project should be transferred to other projects which are carried out at the same time for use by the transportation unit recognized by government and selected by the construction unit, under the deployment of residue earth management.<br>(2) Deploy the earthwork excavation and filling reasonably. Avoid excavating or filling earthwork during rainfall period, in order to prevent water and soil losses, water body pollution or blockage of drainage pipeline caused by rain wash. According to relevant regulations of |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
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| | | | "Management Method on Building Garbage and Engineering Residue Earth of Tianjin", the residue earth department collectively arranges the spoil land transportation routes, which should avoid main residential areas.<br>(3) For reduction of ecological influences, advanced ecological design methods are generally adopted to reduce the losses. The construction activities should be carried out within the land acquisition scope. The temporary land acquisition of construction should be controlled within the red line scope of the planned roads. The construction road mainly makes use of roadbed of roads to decrease the scope of construction activities, decrease occupation of green land and enhance protection for woods and grass land. The newly built construction camps should be set concentratedly or make use of residential areas and enterprises along the line. Random sand scattered setting should be avoided; the household garbage of construction staffs should be transported outwards collectively after they are processed collectively. It is forbidden to discard garbage randomly, which will influence the local ecological environment.<br>(4) The influenced plants and trees in the transformed road sections in project construction must be replanted at other places. The replanting should be carried out within the urban area of Tianjin. And make them survive as possible. Make compensation for trees and plants damaged by permanent land occupation of the project.<br>(5) In order to guarantee safety of the construction and transport vehicles along the line, safety rails should be set in construction operation plane. And set safety warning light and indicating guide-board; In consideration of appearance of the city, the separation rails can be beautified through setting advertisement.<br>(6) Demolition and excavation in construction period should be carried out according to zonation orderly, in order to avoid messy landscape along the line. Baffles (wood, glass, iron sheet and etc) can be set as enclosure to reduce landscape pollution.<br>(7) In the construction, control the scope of construction site strictly. Decrease engineering drainage, construction garbage and treading on original trees and architecture articles on the city roads by construction |

| Technical specification number | Impact factor | Environmental influence | Relieving measures |
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| | | | transportation vehicles and activities of staffs. Reduce the negative influences on city appearance and environment health and city landscape. |
| 1.11.8 | Environment Risk | — | (1) Enhance the construction management and enhance responsibility consciousness;<br>(2) Before construction of municipal engineering, the construction scheme must be submitted to relevant departments of water supply, drainage, power supply, gas and etc. The construction can be carried out only after it is approved;<br>(3) Before the construction, carry out careful investigation for the construction area and define the current situation of municipal pipe networks of gas, water and power, for example, excavating more investigating cross sections;<br>(4) Carry out accident risk evaluation. Find out the most possible accident types and formulate contingency plan for accident precautions. And establish accident emergency group;<br>(5) The construction unit should organize professional staffs regularly to carry out evaluation of relevant staffs of the construction units. The evaluation emphasizes on environment and safety operation knowledge;<br>(6) Enhance training of construction staffs in aspects of safety consciousness, operation skills, emergency disposal methods |