1.General Description Of Project

1.1 Brief Description

The proposed project is one part of the plan of “Five North-South Lines and Seven West-East Lines” of China’s state highways, as well as the important component of the first west-east line of Inner Mongolia’s plan for “Three West-East Lines, Nine North-South Lines and Twelve Exits”. It is also the main highway section going from the west to the east planned recently by the autonomous region, as the main framework of the highways in Inner Mongolia and the main passage connecting Hulunbeier League and other provinces and regions in the east of China.

After the construction in the Eighth Five-Year Plan Period and the Ninth Five-Year Plan Period and with the preparatory work of the project, most sections to the east of Hailar of Shuifenhe-Manzhouli Highway has been constructed or under construction, and other sections have moved into the stage of preliminary feasibility study. Currently, only the project of Hailar-Manzhouli section has not been set up for construction. The proposed project will be linked with Yakeshi-Hailar Highway (to be approved for construction) in the east, connected with Manzhouli Port in the west, and bond with Provincial Highways 201 and 202, etc., thus forming a highway network with State Highway 301 as the main axis and other state, provincial, county and township roads as branches, which can play important roles in economic construction along the highway lines.

1.2 Alignment and Main Control Point

In the recommended scheme for the project of Hailar–Manzhouli Section of Shuifenhe-Manzhouli Highway, the overall routing orientation is from east to west. The starting point is located at Aobao Mountain of Hailar District, linking with the Yakeshi-Hailar Section (K397+000) of State Highway of Suifenhe-Manzhouli. The line goes along old State Highway 301 through Haotetaohai Branch Farm, deviates from the old line at a distance of about 4km to Bayankuren Town, and passes by the north side of Bayankuren Town. The Chenbaerhu Qi Interchange is set up on the north side of Bayankuren Town to connect with Bayankuren Town. The line goes back to State Highway 301 at 3km to the west of Bayankuren Town, crossing Morigele River and going along the west side of Huhenuoer Lake along the old line. A level cross is set up at 11km to the north of East Wuzhuer. The highway goes through West Wuzhuer Sumu and deviates the old line at Cuogangyakou. It then goes straight to the west for 15km and reaches the wetlands where the Hailar Bridge and Xinkai Bridge are set up. The line goes further to the west and through the joint of the Xinkai River and the lake. The Zalainuoer Interchange is set up to the north side of the mineral area and the connection line established to link with Zalainuoer Mineral Area. The highway goes back to the old line at the fence of the

Zalainuoer Mineral Area Hospital, goes through Sanshili Highway Maintenance Squad and Shibali Herding Team, deviates from the old line at 4km to the east of Manzhouli City, passes by the north side of the Oxidization Pond, links with Manzhouli Port Road by level cross, and ended at the new Manzhouli Highway Port. This section routing orientation is illustrated in Figures 1-3.

The main control points of this section: Aobao Mountain (to the north of Hailar), Bayankuren, West Wuzhuer, Cuogangyakou, Zalainuoer Mineral Area, Manzhouli, Manzhouli Road Port (finishing point).

1.3 Forcasted Vehicle Volume In Specified Years

According to the Feasibility Report and the amended report, the traffic flow in future years after the construction of the proposed project is given in Table 1-1.

Table 1-1 Traffic Flow Projection Result

(Small-Scale Standard Vehicle vehicles/d)

Section	2008	2015	2030
Hailar Bei-Chen Qi	8480	16518	38930
Chen Qi-Wuzhuer	6936	13512	32374
Wuzhuer-Cuogangyakou	5888	11394	27376
Cuogangyakou- Zalainuoer	6918	13068	29822
Zalainuoer-Manzhouli	13612	25412	56292
Manzhouli-Manzhouli Port	3976	7744	22324

1.4 Main Engineering and Technical Standards

Main Engineering and Technical Standards are shown in Table1-2.

Table 1-2 Construction Scale of the Proposed Project

Classification	Item		Quantity	Unit	Note
Main body engineering	First Class highway		189.718	Km	
	Earth and stone work	Earthwork	8194.17	$1000m^3$	
		Stonework	1004.694	$1000m^3$	
	Land	Permanent	1084	Ha	

	acquisition	Temporary	172.2	Ha	
	Bridges	Small	352/18	m/bridge	
		Middle	525.5□7	m/bridge	
		Big	1326□4	m/bridge	
	Interchange crosses		4		
	Pathways and passenger overpasses		47		
	Culverts		110		
	Connection line		20		
Supporting engineering	Management branch center		1		Together with Chen Qi Management agency
	Management agencies		2		The management agencies, maintenance area and open main-line toll station at each section is constructed at the same site
	Open main-line toll stations		3		
	Maintenance areas		2		
	Service area		1		Chen Qi Service area
	Parking areas		3		
Auxiliary engineering	Access roads for construction		20.97	Km	
	Access ridges for construction		445/9	m/bridge	
	Construction sites		8		
Public facilities	Septic tanks		5		
	Oily wastewater treatment facilities		2		
Environment. protection works	Greening engineering		189.718	Km	

Table 1-3 Technical Criteria of the Proposed Highway by Sections

Section	Mileage (km)	Highway grade	Vehicle speed (km/h)
K397+000 -- K398+000	1	First Class, newly built	100
K398+000 -- K413+500	15.5	Rebuilt	100
K413+500 -- K425+000	11.5	First Class, newly built	100
K425+000 -- K516+000	91	Rebuilt	100
K516+000 -- K586+718	70.718	First Class, newly built	100
East Wuzhuer Connection Line	11	Hardening pavement	
	9	Newly built	
Chen Qi Interchange	2	Newly built	
Zalainuoer Interchange	2	Newly built	

Table 1-4 Main Technical Indicators

Highway grade	First grade	Note
Topology type	Plain (slight hilly) convex	
Total length of the line (km)	189.718	
Calculated vehicle speed (km/h)	100	
Traveled lane width (m)	2*7.5(7.5)	The values outside the brackets are for integral type cross-section; and those inside are for separate type cross-section.
Roadbed width (m)	24.0(12.75)	
Extreme plain curve minimum radius (m)	400	
General plain curve minimum radius (m)	700	
Minimum radius without cant setting (m)	4000	
Stop stadia (m)	160	
Maximum longitudinal slope (%)	4.0	
Design loading for bridges	Car 20, trailer 120	
Net width of bridge surface building limit (m)	11.0(11.75)	The values outside the brackets are for integral type

Pavement width (m)	10.5(11.25)	brackets are for integral type cross-section; those inside are for separate type cross-section.
Pavement structure type	Bitumen concrete surface	
Road section	Trunk line	

1.5 Main Engineering Amount

The main engineering amount of this proposed project is shown in Table 1-5. The labor and main materials amounts required for the project are shown in Table 1-6.

Table 1-5 Main Engineering Amount

No.	Item	Unit	Quantity	Note
I	Line length	Km	189.718	
II	Roadbed			
1	Roadbed earth and stone work	$1000m^3$		
	Earth work	$1000m^3$	8150.682	
	Stone work	$1000m^3$	999.362	
2	Soft base treatment	Km	21.3	
III	Pavement			
	Pavement length	Km	189.718	
	Pavement layer	$1000m^2$	3452.038	
IV	Bridges and culverts			
1	Culverts		110	
2	Small sized bridge	m/bridge	352/18	
3	Middle sized bridge	m/ bridge	525.5□7	
4	Big sized bridge	m/ bridge	1326□4	
5	Extra sized bridge	m/ bridge	-	
V	Tunnels	m/ bridge	-	
VI	Interchange crosses		4	
VII	Separate crosses		-	
VIII	Pathways and passenger overpasses		47	
IX	Land occupied	ha	1084	
X	Protection work			

	Erath fence	m^3	-	
	Drainage prevention	$1000m^3$	265.985	
XI	Building move	m^3	358	
XII	Electric & telecommunication move	posts	60	
XIII	Optic cable move	Km	1.5	
XIV	Connection line	Km	24	
	East Wuzhuer Connection Line pavement hardening	Km	11	
	East Wuzhuer Connection Line new building	Km	9	
	Chen Qi Interchange new building	Km	2	
	Zalainuoer Interchange	Km	2	

Table 1-6 Labor and Main Material Amounts

No.	Item	Unit	Quantity
1	Labor	Man-day	11,199,947
2	Wood	M^3	1,041
3	Sawn timber	M^3	5□579
4	Rolled steel	T	18,512
5	Steel wires	T	873
6	Bitumen	T	80,696
7	Cement	T	234,049

1.6The Physical Distribution Center

The total land area occupied by the PDC is 24.6ha. In light of the designed annual treatment capacity of 0.8~1 million t of handling capacity of the Center in the short term (the design year is 2013), it has calculated preliminarily that area of land acquisition of the Center would be $80000m^2$.

The construction area of house buildings is about 9,000 m^2, including comprehensive offices, various storages (heating warehouse, refrigerated warehouse and simple storage), motels and

auxiliary facilities, etc. The storages shall be ordinary storage with 8m height piling three-layer of goods. The height of refrigerated warehouse is 3.6m.

2. Assessment conclusion

2.1 ENVIRONMENTAL OVERVIEW AND CURRENT ENVIRONMENT STATUS ASSESSMENT

2.1.1 Overview of Social Environment

2.1.1.1 Economic status

(1) Economic structure

In 2002, the GDP of the whole Hailar is 2553.96 million RMB. The secondary industries include building material, power generation, milk product, brewery and food product. The agriculture mainly includes planting of grains crops, vegetables and stockbreeding. The income of tourism is 98.51million RMB.

In 2002, the GDP of Chenbaerhu Qi is 618.68 million RMB. The industrial products are raw coal, power generation, building materials and milk products.

In 2002, the GDP of Xinbaerhu Qi is 504.00 million RMB. The economy of the whole *qi* depends mainly on stockbreeding and farming. The industrial output value is 36.66 million RMB.

The economy of Manzhouli City mainly depends on trans-frontier trading, tourism, industry and agriculture. The main industrial products are raw coal, power generation, milk products and building materials. The agriculture includes crop planting, stockbreeding and fishery. In 2002, the GDP of the whole city is 2.013 billion RMB.

(2) Farming and herding

The Hulunbeier League is the important farming product production base in Inner Mongolia. The livestock production in the League has developed into benefit-oriented pattern. In 2000, the League further developed milk, flesh and grass, by encouraging the farmers and herdsmen to develop milk industry, and actively introducing and planting good feed grass.

2.1.1.2 Cities and towns and the population distribution along the line

The cities and towns along the proposed project line include: Hailar District, Chenbaerhu Qi, Xinbaerhu Qi, Xinbaerhu Zuo Qi and Manzhouli City.

Hailar District is the capital city of Hulunbeier. At the end of 2002, the total population was 249600, including 23400 of agricultural population and 226200 non-agricultural population. There are 25 nationalities.

Chenbaerhu Qi is located in the northwest part of Hulunbeier League. At the end of 2002, the total population was 56200, including 20000 of agricultural population and 36000 non-agricultural population. There are 19 nationalities.

Xinbaerhu Zuo Qi is located in the hinterland of southwest Hulunbeier Grassland. At the end of 2002, the total population was 39700, including 19700 of agricultural population and 20000 non-agricultural population. There are 12 nationalities.

Manzhouli City, a land route port city in China, is located in the west of Hulunbeier League. At the end of 2002, the total population was 154200, including 670 of agricultural population and 153000 non-agricultural population. There are 20 nationalities.

2.1.1.3 Living quality

With great progress of urban planning and management system construction, the living quality of urban and rural residents has greatly improved.

2.1.1.4 Employment

In 2002, there were 83573 employed persons in Hailar District. The urban registered unemployment rate was 4.6%.

In 2002, there were 760 lai-off workers and 742 re-employment cases in Chenbaerhu Qi. The urban registered unemployment rate in Chenbaerhu Qi and Manzhouli City was respectively 4.6% and 3.2%.

2.1.1.5 Education, culture and public health

In Hailar, the nine-year compulsory education is universal, with primary and middle school enrollment rate reaching 100%. There are 86 medical service institutions (containing medical units, clinics).

In Chenbaerhu Qi, the nine-year compulsory education is universal, with primary and middle school enrollment rate reaching 100%. There are 15 medical service institutions.

In Xinbaerhu Zuo Qi, the primary school enrollment rate is 99.67% and the middle school entrance rate 80.69%. There are 17 medical service institutions.

In Manzhouli City, the nine-year compulsory education is universal, with primary and middle school enrollment rate reaching 100%. There are 69 medical service institutions.

2.1.1.6 Traffic environment

The infrastructures construction has had great advancement in Hulunbeier City, but still lagging behind relatively.

The existing highway, starting from Hailar District in the east to Manzhouli City in the west, is part of State Highway 301. The highway is 203km long, was re-built in 1994 according to Grade 3 highway. After seven years of operation and especially impacted by the disruption of extra large flood in 1998, the entire service level of the highway is low and currently being the co-existence of Grade 2 and Grade 3. The technical criteria of existing highway, such as roadbed height and width, pavement width, intensity and smoothness, and line vertical slope, are low and the passing capacity is poor.

2.1.1.7 Resource utilization

The overall characteristic of land resource in Hulunbeier League is its large quantity, with the land area accounting for 11.9% that of Inner Mongolia.

The mineral resources are rich in the proposed project area. Nine kinds with 43 species and 370 mineral sites of minerals have been explored or initially explored.

Hulunbeier League has many kinds of tourism resources with grasslands, forest landscape, ethnic feeling, and historic relics.

2.1.1.8 Cultural relics resource

According to the survey report on cultural relics along the proposed alignment areas, which was conducted by the Hulunbeier Cultural Relics Management Committee, there are no important cultural relics and cemeteries along the road construction area. If cultural relics are found during the highway construction, the Construction Unit will take joint protective measures with the Hulunbeier Cultural Relics Management Committee.

2.1.2 Overview of Natural Environment

2.1.2.1 Geographical location

The proposed project is located in Hulunbeier City of Inner Mongolia Autonomous Region, starting from Hailar District, through Chenbaerhu qi, Xinbaerhu zuo qi and Manzhouli City, and ending at New Manzhouli Highway Port.

2.1.2.2 Topology and landform

The project area lies to the west of Daxing’anling Mountains, belonging to Hulunbeier Plateau landform area. The landform types are complex, including erosive and denuded low hilly area and denuded high plain (alluvial plain, lacustrine plain and sandy land, etc.).

2.1.2.3 Geological characteristics

The stratums in this project area include rocks in Upper Proterozoic group, Ordovician system, Jurassic system, Cretaceous system, Quaternary system and intrusive rock.

According to *China Earthquake Intensity Zoning Maps* (1990), the project area has the earthquake intensity of VI degree.

The unfavorable and special geological conditions in the project area include sand storm, saline and alkali soil, marsh muddy soil and humic soil, etc.

2.1.2.4 Climate and meteorology

The project area belongs to warm temperate zone continental monsoon climate, with long winter and short summer. The spring and autumn seasons are nearly linked and the change of temperature is very great. The average yearly temperature is -2.l □. The average monthly temperature is -26.8□ in January , 19.9□ in July, with the annual range of 46.7□. The annual average wind speed is 3.4m/s, with the maximum wind speed of 25.7m/s under the direction of NWW.

2.1.2.5 Hydrology

The surface water system of the proposed project area belongs to that of the Erguna River, which is the upper source of the Heilongjiang River. The Haier River and the Dalaneluomu River merges at nearby Abagaitu Mountain and forms the Erguna River. The mainstream of the river is the boundary river between China and Russia. The main surface waters include the Hailar River and Hulun Lake.

2.1.3 Surface Water Environment Baseline

Three monitoring sections were set for surface water along the proposed highway line. The monitoring of current status of surface water was carried out from December 6~8, 2002. Considering the characteristic pollutants in the wastewater and the characteristics of the regional surface water, 4 items (factors) are selected for monitoring, i.e. pH, SS, COD and oil.

The rivers under monitoring have been polluted by organic pollutants obviously. All the COD values exceed national standard value, belonging to Class V or worse water body. The reasons for the water quality pollution of the rivers include:

(1) The Morigele River is a river flowing through the grasslands, with small river run-off. The rotten matters from riverbed scouring and non-point sources, feces of cattle and sheep, and drinking water by plenty of cattle and sheep in the rivers have contributed to the increase of organic pollutants in the rivers and the high concentrations of COD measurement.
(2) The water pollution is serious in the Hailar River under drought period with very small flow, affected by industrial and residential wastewater discharge from Yakeshi, Dayan and Hailar cities along the river. The problem has been paid high attention to by various levels

of governments. A plan of integrated control for the river basin has been formulated, and treatment engineering projects will be kicked off from now on. The aim is to obviously improve the water quality in the river in 2 to 3 years.

(3) The Xinkai River is the flood drainage river for Dalai Lake. The natural eutrophication in Dalai Lake has led to high COD concentration in the lake. Also, in the freezing periods, the ice accounts for a big proportion in the total water volume, having obviously resulted in further enrichment of pollutants.

2.1.4 Air Environment Baseline

According to the requirements of the TOR for this EIA, representative sensitive sites within 200m along the project line are selected for monitoring of current status of air environment.

Three continuous days with non-abnormal meteorological conditions were selected to perform monitoring. The time duration: December 5~8, 2002. Monitoring items: TSP and NO_2.

The daily averaged TSP concentration in the assessment area is below the national standard limit. The one-time NO_2 measurement at one monitoring site exceeds the allowable value. This is mainly caused by special weather conditions (temperature inversion). The ambient air quality in the assessment area is basically clean and basically meets with national Class II standard. As seen from the statistics table of pollutant load coefficients of individual pollutants, the load coefficient of NO_2 and TSP in the assessment area is basically 60% and 40%, showing that the pollution of NO_2 is slightly heavier than that of TSP, which is a result of special one-time measurement values.

2.1.5 Noise Environment Baseline

According to the noise sensitive sites within 200m to the central line of the highway and their function requirements, 5 monitoring points are identified for noise environment monitoring.

Monitoring time: January 15~16, 2003.
Monitoring frequency: twice time intervals respectively representing the daytime and night.

The monitoring results are shown that the daytime noise at Haotetaohai Brach Farm, the Fifth Team of Haotetaohai, West Wuzhuer Sumu and Yihe is ranging between 45.6~64.4 dB (A), and night noise between 39.5~54.7 dB (A). The noise environmental quality can meet Class 4 limit values. The daytime noise at the enclosure of Zalainuoer Mineral Area Hospital is ranging between 63.5~65.2 dB (A), and night noise between 50.7~54.6 dB (A), higher than Class 1 standard limit. This is mainly contributed by heavy highway traffic of Zalainuoer Mineral Area on the south side of the hospital.

2.1.6 Ecological Environment Baseline

2.1.6.1 Survey of landscape ecology types

Based on satellite RS and GIS techniques and in combination with field survey, the ecological landscape types have been investigated within the project region, with the survey scope of 11470.0ha, which covers the area within 300m to both sides of the highway and that within 100m around the borrowing and waste earth yards. The main landscapes are grassland landscape, wetland landscape, forestland landscape, sand landscape, human building landscape, and arable land landscape.

The first landscape in the project area is grassland landscape, with a total area of 7386.6 ha, or 64.4% of the total assessment area. The grassland is the main component of Hulunbeier Grassland area, forming important base of landscape in the area. Continuous and large grasslands, with small number of patches, characterize the landscape.

The second landscape is wetland landscape, characterized by huge wetland area, relatively centralized distribution, a good number of patches forming the wetland landscape, rich bio-resources, high biodiversity and bio-productivity, and sound stability of ecosystem structure. The wetland ecosystem includes Huhenuoer Lake, Benpo Lake, Erka Wetland, the Morigele River, the Hailar River, the Xinkai River and their flooding lands, etc., with a total area of 3235.2ha, accounting for 28.2% of the total assessment area.

The forestland landscape includes mainly pinus sylvestris var mogolica, man-made forest, sand small arbor forest, etc., with an area of 26.3ha, accounting for 0.23% of the total assessment area.

The sand landscape has an area of 170.3ha, accounting for 1.48% of the total assessment area. This includes bare sand landscape and stabilized and semi-stabilized sand landscapes. There is a bare sand landscape distributed in belt form along the Hailar River, and there are also patch-form sand lands by State Highway 301 and on the grasslands, being moving sand dunes or semi-stabilized sand dunes.

The area of human building landscape is 673.3ha, accounting for 5.87% of the total assessment area. This kind of landscape does not have big proportion in the project assessment area, and mainly includes residential areas of cities, towns and sumu, and landscape of highways, natural roads and construction land uses.

The arable land is mainly dry-farming farmland, with an area of 72.5ha or 0.63% of the total assessment area.

2.1.6.2 Survey of vegetation

Hulunbeir Environment Mornitoring Station has moninitored the vegetation of this assessed area for years. By field investigation and analysis of series samples from percific area in different period, the Station has accieved much valueable data, which helps to discribe the general vegetation situation of the assessed area.

Based on an overview of the plant resources in the project area, there are a total of 440 species of wild advanced plants, respectively belonging to 240 genera and 66 families.

The grasslands in the project area are located in Middle Asia sub-zone of Eurasia grassland plant zone, typical of grasslands in the mesothermal grassland belt. The geographical composition of the flora in the region is complex, with 20 types.

Affected by local topology and other non-zonal factors, there are distributed intrazonal vegetation, such as meadow, salinization and sand vegetation, etc. Typical grassland is zonal vegetation in the region, widely distributed in the fluctuating high plains and including Stipa grandis, Chinese wildrye, Stipa krylovii and Artemisia frigida, etc. The sand vegetation is distributed over stabilized and semi-stabilized sand dunes in the project area, growing with trees such as pinus sylvestris var mogolica, Malus baccata and elm. Meadow vegetation is an intrazonal vegetation. There is a large area of wetland, covered with developed meadow vegetation including Carex, weed and salinized meadow. The shrub vegetation is mainly distributed along the banks of the Hailar River. The marsh vegetation in the project area is mainly reed marsh, distributed in seasonal or perennial pools zones at low flood lands of Erka Wetland in Manzhouli. Aquatic vegetation is scattered in the shallow waters on the shore of the lakes and rivers.

2.1.6.3 Survey of wild animals

According to the record of field observation carried out for more than 20 years by Hulunbeir Environmental Morintoring Station, a basically analysis of information on wilid animals of the assessed area is as follows.

There is a record of 226 species of wild animals (vertebrates) in the assessment area, including 37 fishes, 10 amphibians and reptiles, 38 mammals and 141 birds.

There are found 37 species of wild fish in the water system in the project area, belonging to 5 orders and 9 families. 5 species of amphibians, including Rana amurensis, Rana nigromaculata, Salamandrella keyserlingi, Bufo raddei and Rana chensinensis, are found and widely distributed in the assessment area. There are 6 orders, 14 families and 38 species of mammals, mainly with small ones and no large carnivorous and herbivorous animals.

Among 141 species of birds, there are 6 species of national Class I key protective birds, i.e. Grus leucogernaus, Grus japonensis, Grus monacha, Otis tarda, Ciconia ciconia and Ciconia nigra. There are 6 species of national Class II key protective birds, i.e. Platal leucorodla, Cygnus cygnus Cygnus, C. columbianus, Aquila rapax, Aquila heliaca, Milvus migrans, Buteo hemilasius, Buteo buteo, Buteo lagopus, Aegypius monachus, Circus cyaneus, Circus aeruginosus, Circus cyaneus, Pandion haliaetus Falco cherrug, Falco rusticolus, Falco peregrinus, Falco amurensis, Falco tinnunculus, Grus grus, Grus uipio, Anthropoides uirgo, Numenius borealis, Nyctea scandiaca, Athene noctua and Asio flammeus.The wild animals are mainly concentrated in Erka Wetland.

2.1.6.4 Survey of soil environment

The typical soil types in the project area include dark Castanozems soil, meadow soil, bog soil, saline soil, and Aeolian soil, among which dark Castanozems soil is zonal soil, and meadow soil, bog soil, saline soil, and Aeolian soil are intrazonal soils.

2.1.6.5 Survey of main eco-environmental problems

(1) Grassland degradation

Affected by unreasonable utilization such as over-exploitation of medicinal materials and natural disasters such as drought pests, the grassland ecosystem has been under interference exceeding the thresholds, resulting in destruction of grassland resources, wide degradation and desertification of grasslands, and great reduction of good pastures.

(2) Soil salinization

At present, there is an area of 55.1 km^2 with obvious soil salinization in the assessment area.

(3) Soil erosion

The soil erosion in the assessment area includes mainly water erosion and wind erosion. The grassland in the assessment area belongs to high sensitive zone of wind erosion desertification, with serious soil wind erosion.

2.1.7 Erka Wetland Current Status Assessment

Erka Wetland is located within Hulunbeier City, Inner Mongolia, with east longitude of 117□45′~118□16′ and north latitude 49□17′~49□41′. The total area is 52800 ha.

2.1.7.1 Landform

The landform of Erka Wetland is mainly comprised of lakeshore plain, alluvial plain, river flood plain, sand land and sand hill, high plain, etc.

2.1.7.2 Soil

The soil in the area includes mainly salinized meadow soil, salinized Castanozems soil, meadow bog soil, alkalized meadow soil, meadow alkali soil, meadow Castanozems soil, alkalized Castanozems soil, Aeolian soil, and sandy Castanozems soil.

2.1.7.3 Hydrology

The main rivers in the region are the Hailar River, the Erguna River and the Xinkai River.

2.1.7.4 Landscape ecology patterns

Erka Wetland landscape is mainly comprised of wetland landscape and sand wetland landscape.

Wetland landscape is the most important landscape in Erka Wetland.The wetland landscape can be classified by vegetation form and wetland type into riverbank shrub forest wetland landscape, reed marsh landscape, reed and weeds marsh wetland landscape, salinized meadow landscape, river wetland, and lake wetland, , river and lake lowland salina.

The sand landscape is widely distributed. According to vegetation type and landform composition, the sand landscape can be classified into three types, i.e. sand Mongolian scotch pine landscape, sand shrub forest landscape, and bare sand landscape.

2.1.7.5 Plant resources

Based on the survey on Erka Wetland, there have been found 257 species vascular plants, respectively belonging to 57 families and 165 genera. Erka Wetland is not only large in area, but also with good conservation and diverse types. The wetland vegetations include hydraulic, marsh and meadow plants with 44 communities.

2.1.7.6 Wild animal resources

There is a record of 226 species of wild animals (vertebrates) in Erka Wetland, including 37 fishes, 10 amphibians and reptiles, 38 mammals and 141 birds.

There are found 37 species of wild fish in the water system in the project area, belonging to 5 orders and 9 families, respectively being 3 families in Cypriniformes order (Cyprinidae, Cobitidae, Siluridae), Salmoiformes order (Salmonidae,Esocidae), Gadidae family of Cadiformes order, Petromyzonidae family of Petromyzoniformes, and Perciformes order (Eleoyridae,Channidae). The Cyprinidae family of Cypriniformes order is absolutely dominant. Except 2 species of Salmonidae family,2 species of Siluridae family, 3 species of Cobitidae family, 1 species of Channidae family and 1 species of Esocidae family, others all belong to Cyprinidae families.

2.1.8 Natural Reserves

According to investigation at Hulunbeier Environmental Protection Bureau (EPB), and

browsing of related materials, there are no national or Inner Mongolian natural reserves along Hailar-Manzhouli Section line.

The national rare fowl wetland reserves in Hulunbeier City include Dalai Lake Natural Reserve and Huihe River Natural Reserve.

Dalai Lake Natural Reserve is located among Xinbaerhu You Qi, Xinbaerhu Zuo Qi and Manzhouli City. It was list among the world's important wetlands of *Wetland Convention* in 1992. Huihe River Natural Reserve is located in the southwest of Hulunbeier City of Inner Mongolia, lying in the administrative areas of Ewenke Nationality Autonomous Qi and Xinbaerhu Zuo QI.

2.1.9 Current Situation of Water and Soil Erosion

According to the announcement of "*Major Prevention Divisions for Water and Soil Erosion in the Inner Mongolia Autonomous Region*", the areas involved in the project to be implemented belong to the major prevention divisions for water and soil erosion in the announcement issued by the People's Government of the Inner Mongolia Autonomous Region.

The area of water and soil erosion in the highway construction areas is 466.5 hm^2 □38.4% of the total area of the project construction areas.

According to current status of social environment and natural conditions of the project area, the main environmental protection targets along the highway are identified, including grassland, wetlands, related rivers, and residents along the highway line. See Table 2-1.

Table 2-1 Main Environmental Protection Targets along the Highway

Sensitive plots along the line	Environmental protection targets	Relation with the highway	Main sensitive environment
Hulunbeier Grassland	Residents in Haotetaohai	Within 44m on both sides (475 households, 1662 people)	Noise environment; air environment
	Residents of the 5th Production Team in Haotetaohai	About 46m to the left of the highway (42 households, 138 people)	
	Residents in West Wuzhuer	About 76m to the left of the highway (256 households, 1195 people)	

		Residents in Yihe	About 60m to the left of the highway (17 households, 58 people)	
		Zalainuoer Mineral Area Hospital	About 140m to the fence on the left side of the highway (4 floors, 260 beds)	
		Landscape, wildlife	The highway crossing the typical grassland	Eco-environment
		Stabilized and semi-stabilized dunes; decertified grassland, grassland vegetation	The highway crossing Hailar River and the dunes on both sides of the river; crossing dune belt to the east of Cuogang Town	Eco-environment
Erka Wetland		Wetland landscape	The highway crossing Erka Wetland for 13.2km.	Eco-environment
		Wild animals		
		Wild plants		
		Soil vegetation		
		Second Water Source of Manzhouli City		
Lake	Huhenuoer Lake (1900ha)	Animals and plants	The highway is 500m away from the south side of the lake.	Eco-environment
	Benbo Lake (500ha)	Animals and plants	The highway is 500m away from the nouth side of the lake.	
River	Morigele River (K431+870)	River water quality (Class III function)	Crossed by the highway bridge	Surface water environment
	Hailar River (K543+850)	River water quality (Class III function)	Crossed by the highway bridge	
	Xinkai River (K550+150)	River water quality (Class III function)	Crossed by the highway bridge	

Note: No sensitive spots such residences are found along the line of earth borrowing yards and waste earth yards.

2.2 ENVIRONMENTAL IMPACT PROJECTION AND ASSESSMENT

2.2.1 Social Environment and Emigrant Settlement Impact Analysis

2.2.1.1 Social environmental impact analysis

Communication and transport is a comprehensive and leading base industry for the development of national economy. The proposed highway will play important roles in the inter-regional economic development and material exchange.

The proposed project will bring about important long-term positive impacts on the development of regional economy.

The construction of the proposed project will bring along the urban and rural construction along the line, promote the exploitation and utilization of land and resources.

The tourism in the project area will develop rapidly. The demand for transport of energy, raw materials, building materials and passengers is great, the construction of the proposed project will promote increase of proportions of the secondary industry (mainly industrial and building materials sectors) and tertiary industry (mainly transport, commerce, finance and issuance sectors) in all the three industries. The construction of the proposed project will increase a plenty of employment opportunities, and thus alter the employment structure. The number of employees and urban individual laborers will increase somewhat.

2.2.1.2 Impact on employment and unemployment

The construction of this project will directly and indirectly increase a lot of employees.

According to related stipulations on construction project in China, the local governments and construction unit will be responsible for the settlement of work or re-allocate new rangelands for them.

2.2.1.3 Impact on emigration

In respect of removal settlement, local governments and village committees will be responsible for the settlement nearby original sites. The construction unit will pay the compensations for removal, to build new houses. This can avoid large-scale long-distance removal, and minimize the social impacts from the removal as far as possible.

2.2.1.4 Impact on public facilities

As part of the proposed highway will utilized original State Highway 301, the local transport may be affected in the Construction Period, which can be alleviated through building construction access roads and reasonably allocating construction time.

The construction of the proposed project will also greatly promote improvement of local tourism conditions.

2.2.1.5 Impact on social security

Hulunbeier City is a minority agglomeration with Mongolian as the main body and Han people with the most population. The construction of this highway will play important roles in pulling up the economic development along the line, improving the travel conditions, further enhancing exchange and communication between the minorities in the border area, promoting unity of all the nationalities, and maintain the social stability.

The Construction Period will last for 3 years. Persons from the outside will be employed besides local people. Therefore, personnel management for the construction team should be strengthened to avoid their impacts on the living of local residents.

2.2.1.6 Impact on cut-offs

The design of the project has already considered pathways for herdsmen and tractors, so as to alleviate impacts of the highway on the traffic cut-offs. Based on public consultation survey, pathways and passenger overpasses are increased from 30 to 47 and culverts from 104 to 110, compared with original design.

Table 2-2 Summary of Pathways along the Line

Name of engineering	Unit	Quantity	Note
Interchange crosses		4	The pathways are mainly set in the areas with dense population. There are a total of 47 pathways .
Pathways and passenger overpasses		47	
Level crosses		27	
Small sized bridge	m/bridge	352/18	There are totally 139 bridges and culverts.
Middle sized bridge	m/ bridge	525.5□7	
Big sized bridge	m/ bridge	1326□4	
Culverts		110	

The highway will have some impact on the livestock breeding when going through the pastures. During the construction documents design phase, these impacts should be fully considered and sufficient pathways reserved.

2.2.1.7 Impact on hydrology

(1) The impact on surface water

There will be 4 big-sized bridges (totaling 1326m), 4 middle-sized bridges (525.5m), and 18 small-sized bridges (totaling 352m) along the project line.

On the basis of original feasibility study, some adjustment are suggested for the wetland sections. After the adjustment, the total length of bridge will be 480m longer, which can meet

with the flood drainage requirements of the Hailar River and the Xinkai River, and avoid runoff cut-offs of the rivers and wetlands as the result of construction of the proposed highway.

(2) The impact on the groundwater

Reasonable design scheme and engineering measures will be considered and adopted for bridge base and ground base during the Design Period in order to reduce the impact on the groundwater.

2.2.2 Surface Water Environmental Impact Analysis

2.2.2.1 Water environmental impact in the Construction Period

- The construction machineries contain oily wastewater that may yield oil pollution of rivers when it is discharged in to the rivers.
- The construction materials such as bitumen, oil and chemicals can pollute the waters after being washed by the rainfall if not properly managed.
- The sewage and garbage from constructors can be directly discharged into the rivers and pollute the river water if the management is not strengthened.

2.2.2.2 Water environmental impact in the Operation Period

(1) Bridge surface rainfall runoff pollution projection

The rainfall in the region is concentrated in June to August, accounting for 70% of the total annual precipitation. This belongs to high water period with larger water flow. The discharge of initial rainfall into the water body can have some impact on the water quality. The impact should stop as the rain stops therefore belonging to short-term impact.

(2) Sewage impact of service areas

According to the feasibility study of the proposed highway, a service area will be setup at Chen Qi.

The sewage from the service area must be treated before discharging in to the surface water. It is suggested that comprehensive treatment facilities be set up for living sewage and oily wastewater, in order to guarantee the compliance with Class 2 requirements of *Farmland Irrigation Water Quality Standards* (GB5084-1992) (COD□300, SS□200mg/L, oil□10mg/L).

2.2.3 Ambient Air Impact Projection and Assessment

2.2.3.1 Ambient air impact in the Construction Period

The air pollution of the highway in the Construction Period comes mainly from the following linkages: (1) resuspended dust from lime-soil mixing, bitumen concrete mixing and vehicle transportation; and (2) bitumen smoke from bitumen concrete preparation and on bitumen laying on the road surface. Detailed analysis is as follows.

In the Construction Period, the resuspended dust will have some impact on the ambient air along the line, with the impact scope within 200m of the construction site. Among various construction activities, the lime-soil mixing and vehicle transportation are most important sources of resuspended dust. They can have obvious impact within 100m downwind of the construction site.

In the construction of the bitumen pavement, the bitumen smoke is another important pollution source, in addition to resuspended dust. It is mainly generated from the processes of bitumen cooking, mixing and pavement laying, among which bitumen cooking has the largest emission of bitumen smoke. If the type of mixers is properly chosen, the close-type plant-mix process can have small impact of bitumen pollution on the ambient air.

2.2.3.2 Ambient air impact in the Operation Period

Two representative sections of the proposed highway, West Wuzhuer (K493+400) and Mineral Area Hospital (K557+800) are selected for projection of daily averaged NO_2 concentration distribution on the sides of the highway in 2008, 2015 and 2030. The results are illustrated in Figure 2-1 and Figure 2-2.

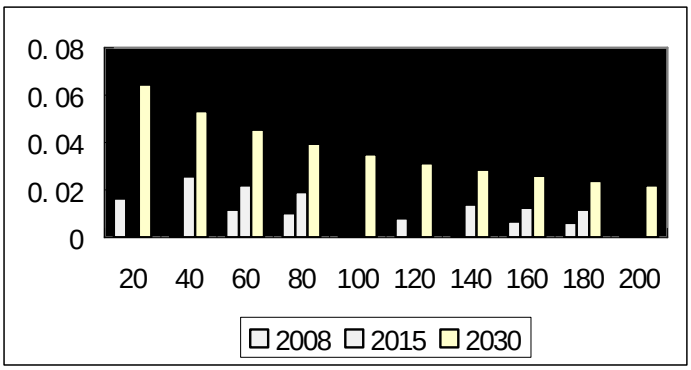


Figure 2-1 NOx Daily Averaged Concentration at West Wuzhuer (K493+400)
Unit: mg/m^3

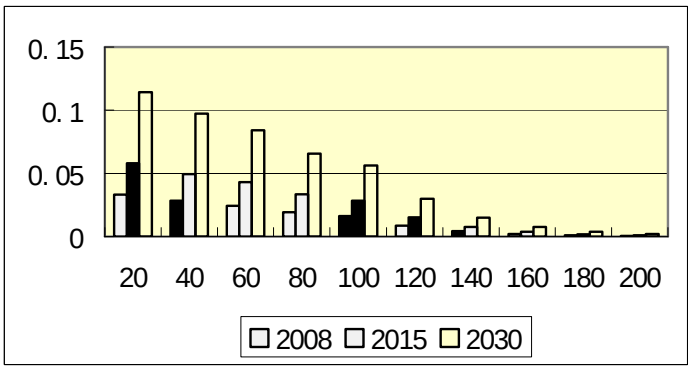


Figure 2-2 NOx Daily Averaged Concentration at Mineral Area Hospital (K557+800) Unit: mg/m^3

From the above figures, it can be seen that the impact of NOx concentration is mainly nearby the highway (between 0-40m from the highway sides). In the long future in 2030, the NOx concentration on the sides of the highway does not exceed the Class 2 standard stipulated in GB3095-1996.

2.2.4 Noise Environmental Impact Assessment

2.2.4.1 Noise environmental impact analysis in the Construction Period

Common machineries for highway construction include electric generators, excavators, bulldozers, Land levelers, road compressors, spreaders, cranes, and transport vehicles, etc.

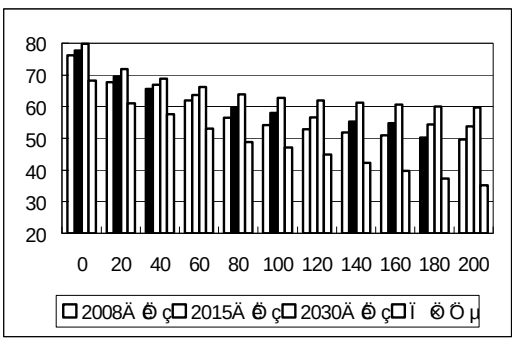
Compared the estimation results with the reference standards, the impact scopes of various machineries in the daytime are all within 50m. The noise will be below 70 dB(A) beyond 50m, and below 60 dB(A) beyond 100m.

The impact scope at night is greater. The noise will be 55 dB(A) only beyond 100m for most construction machineries, and it can reach 55 dB(A) only beyond 300m for land levelers, mechanical loaders and other high-noise machineries.

The noise impact of construction is limited in the Construction Period and will disappear once the construction is finished. Also the construction noise has intermittent or sporadic (e.g. pile drivers) characteristics, and will not have serious impact if the construction stops at night.

2.2.4.2 Traffic noise impact projection and assessment in the Operation Period

Within the assessment scope of the two sides along the proposed project line in the Operation Period, the distribution of ambient noise at sensitive sites for different sections in 2008, 2015 and 2030 is illustrated in Figures 2-3 ~ 2-7. From the figures, the ambient noise at sensitive sites for the whole highway in 2008, 2015 and 2030 is summarized in Table2-3.



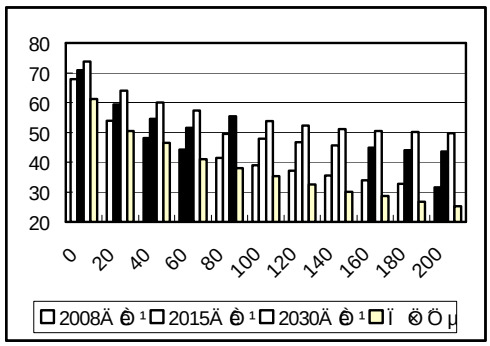


Figure 2-3 Projection of Traffic Noise Distribution at Haotetaohai Branch Farm (K404+300)

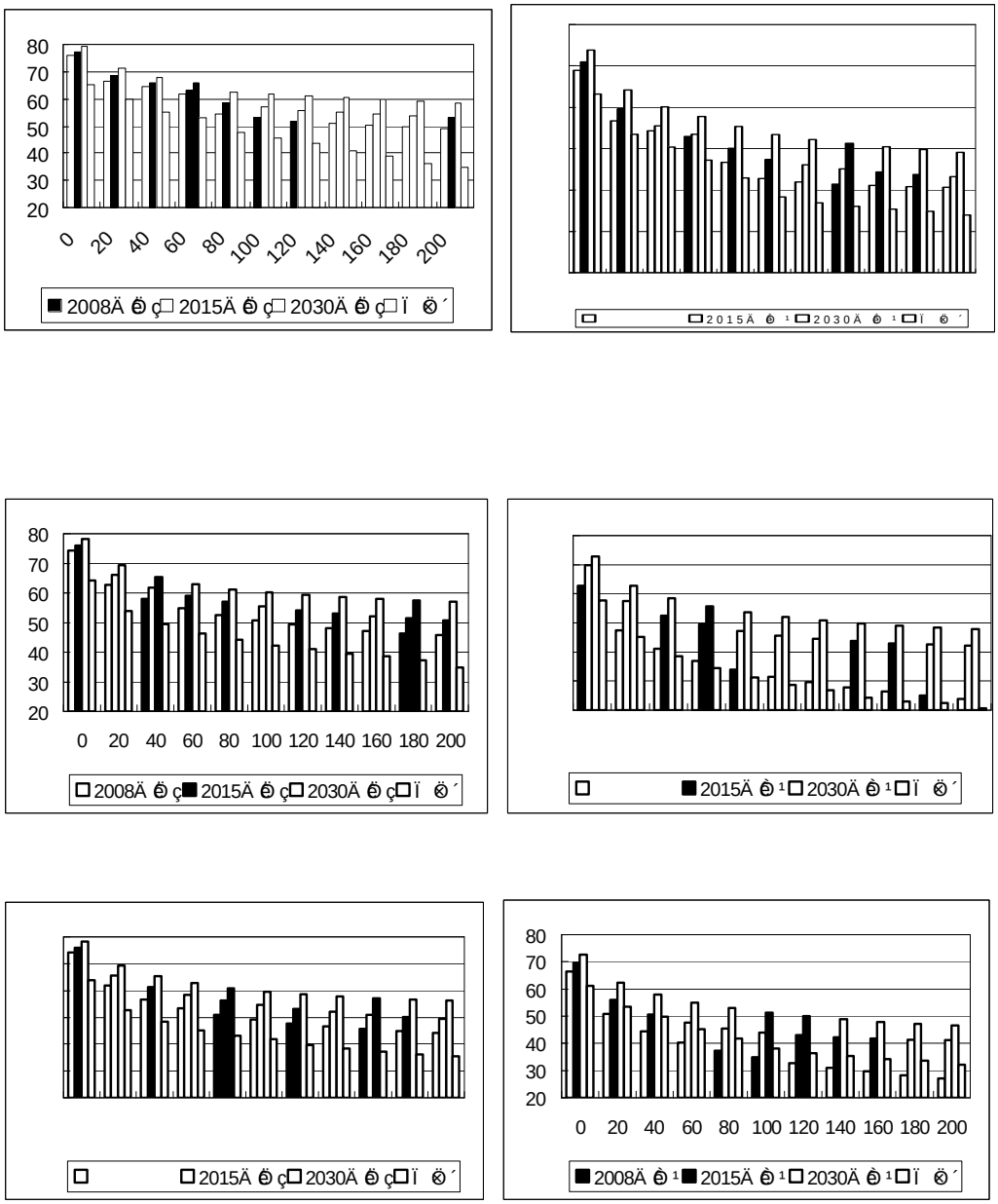


Figure 2-6 Projection of Traffic Noise Distribution at Yihe (K505+500)

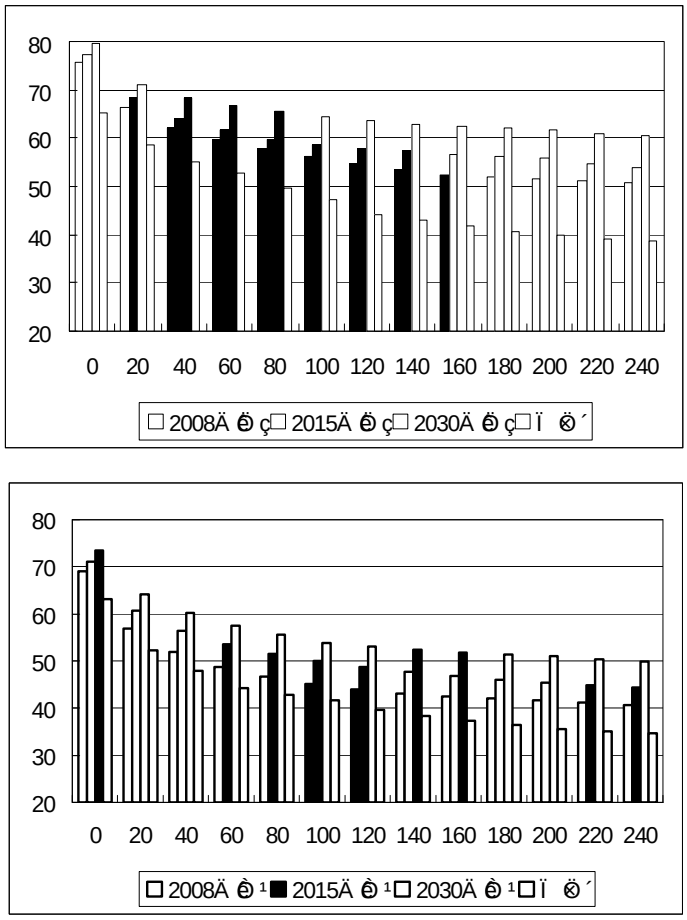


Figure2-7 Projection of Traffic Noise Distribution at Mineral Area Hospital (K557+800)

Haotetaohai and the first household of the Fifth Team are near the proposed highway. The long-term noise projection at night at Haotetaohai Branch Farm exceeds the standard value by 4.5dB(A), and the medium-term and long-term noise projections at night at the Fifth Team of Haotetaohai exceed the standard value by 0.1dB(A) and 2.3dB(A) respectively.

The long-term noise projection at night at West Wuzhuer exceeds the standard value by 2.9dB(A). The projected noise levels at other residential areas call meet with the national standards.

The medium-term noise projection at night at Mineral Area Hospital exceeds the standard value by 4.1dB(A), and the long-term noise level in the daytime and at night exceeds by 5.37dB(A) and 6.27dB(A), respectively. To reduce the noise impact, six lines trees are planning to be planted between the road and hospital. There are no medical wards near the north enclosure of the hospital and it is 100m from the In-patient Building to north enclosure. The noise impact of the proposed highway on the In-patient Building will be very small.

Table 2-3 Ambient Noise Level at Sensitive Sites of Proposed Highway in the Operation Period

No.	Sensitive site name Post No.	Sensitive site type	Distance to line center (m)	Year	Max. projection value dB(A)		Value exceeding the standard dB(A)	
					Daytime	Night	Daytime	Night
1	Haotetaohai Branch Farm K404+300	Residential area	44	2008	65.3	47.5	-	-
				2015	66.79	53.2	-	-
				2030	68.81	59.5	-	4.5
2	Fifth Team of Haotetaohai K409+700	Residential area	46	2008	64.3	52.94	-	-
				2015	66.01	55.1	-	0.1
				2030	68.1	57.3	-	2.3
3	West Wuzhuer K493+400	Residential area	76	2008	54.2	44.0	-	-
				2015	58.9	51.7	-	-
				2030	62.6	57.9	-	2.9
4	Yihe K505+500	Residential area	60	2008	62.02	50.31	-	-
				2015	55.48	53.26	-	-
				2030	65.09	54.76	-	-
5	Mineral Area Hospital, north enclosure K557+800	Hospital	140	2008	50.94	49.35	-	-
				2015	54.63	49.1	-	4.1
				2030	60.37	51.27	5.37	6.27

2.2.5 Ecological Environmental Impact Projection

2.2.5.1 Impact on ecological complexity of regional natural system

Only a proportion of 9.52% grasslands and wetlands out of the assessment area will be changed, while other 90.48% of grasslands and wetlands will remain unchanged. Therefore, the role of main body of grasslands and wetlands in the region will not be altered, and the implementation and operation of the engineering will not generate major impacts on complexity of regional natural system.

2.2.5.2 Land use and livestock production loss

The permanent land occupation will be 1084ha. The present grassland along the proposed highway line is mainly of high and medium coverage. Calculated at an average of fresh grass yield of 3000 kg/ha, there will be a reduction of about 259.4×10^4kg fresh grass annually along the highway line due to the permanent land occupation.

2.2.5.3 Landscape impact analysis

Among the mosaics in the project area, the D_o of grasslands is highest, being 60.4%. In addition, the landscape proportion (L_p) of grasslands is 64.0%, and the occurrence frequency R_f

85.1%. This states that the grassland is the control composition in regional eco-environmental quality. However, the natural environmental characteristics also determine that the grassland ecosystem has obvious fragility and has weak anti-interference ability.

The local land use patterns will make change after implementation and operation of the highway engineering. The dominance of human building (mainly roads) mosaic will increase from 10.8% to 14.0%. The dominance of grassland and other mosaics will only have small changes and the dominant role of grassland will not change. This indicates that the implementation and operation of the proposed project will not have major impact on the quality of natural system in the assessment area.

2.2.5.4 Ecological impact analysis in the Construction Period

(1) Loss of biomass

Temporary land occupation is required for building construction access roads and living camps and piling materials, etc. in the construction of highway. The total area of temporary land occupation will be 539ha.

The excavation of earths and stone and vehicle transportation will bring about resuspended dust that can naturally settle on the leave blades of surrounding vegetation, obstruct the stomas, affect the respiration and photosynthesis, and have negative impact on the growth of plants.

This kind of impact is in short term and reversible. After the end of construction, the vegetation on the temporarily occupied land will start to rehabilitate.

(2) Impact on wild animals

The highway will have obvious impacts on small animals such as rodents, amphibians and reptiles. However, this impact should be temporary, will disappear gradually after the end of construction, and will not affect their living and population quantity. As there are currently few large, mammals along the line, the construction of the engineering will have small impact on large mammals. The construction will have major impacts on the birds along the line, especially on the birds habilitate and act in the wetland along the line. The construction will occupy and destruct the original habitats and existence environment of the birds, forcing them to flee to other places. After the construction, some birds may return to the region, but others especially those that are more sensitive to human interference will migrate to other places.

(3) Impact on soil environment

The impacts of the engineering construction on the soil environment will on the aspects of soil salinization, soil erosion and soil desertification, etc.

2.2.5.5 Ecological impact analysis in the Operation Period

(1) Impact on animals

In the sections that utilize old highways, there is already cut-off on the animals. The animals have got used to the cut-off of pathways. When the road is widened, the cut-off degree will be increased. Therefore, the utilization of old roads will have less cut-off impact on the animals. Because the large and medium wild animals along the highway line are small in number, the highway as a barrier will not have major impact on the migration of large and medium wild animals. Among the large and medium mammals that are acting along the line are most domestic breeding animals, such as horse, cow and sheep, etc., which activities can be guaranteed by setting up bridges and culverts and specific passages to alleviate the negative impacts. In addition, the impact on the domestic animals may become less when they get used to the new environment in some time.

(2) Impact of land use patterns change on mini climate

According to on-site investigation, many groups of Melanocorypha Mongolica are currently flying over or resting on the roads, and are liable to striking by the vehicles.

Also the possibility that some small reptiles and rodents are rolled to death when they cross the highway is high.

(3) Surprising wild animals

After operation of the highway, the traffic noise will permanently affect the animals nearby. The noise from the running vehicles can directly scare and disturb the birds and other animals in the region, having certain impact on their habitation and breeding. This may force the animals to flee away from the region, resulting in reduction of animal varieties and quantities along the line. In the wetland and lake areas through which the highway goes, the birds are concentrated, and there are in particular many national protective birds. The running vehicles could seriously affect the habitation and activities of them. It is suggested that marks of prohibiting sound horns set up at the highway section, so as to reduce the scaring and disturbing of the wild animals.

(4) Impact of land use patterns change on mini climate

There are the Moergele River, the Hailar River, the Huhenuoer River and Erka Wetland, etc. nearby the highway line, the wetland area is large with and much evaporation, the adjustment ability of mini climate in the project line area is strong, and thus the humidity and temperature of the mini climate will not change obviously.

2.2.5.6 Impact of species intrusion

The proposed project line starts at Hailar District and ends at Manzhouli City. Manzhouli is an important port; foreign species transferred through international shipping will first arrive at this port. The foreign species often have harmful impact on the system and structure of the

ecosystem, and endanger the local species, especially rare and endangered ones, causing the loss of biodiversity.

In order to avoid harmful impact from foreign species introduction, preventive and control measures should be adopted.

2.2.5.7 Solid waste Environmental Impact Analysis

(1) Construction Period

Based on the engineering analysis, the solid wastes generated from the proposed project will be mainly from the Construction Period, with the following kinds: engineering construction waste earth, building garbage, and living garbage of the constructors.

Before the siting of waste earth yards, notifications to the local residents, government and negotiations with the public have been put into effect. The local residents and government agreed the site selections of the waste earth yards, and the waste earth yards have passed professional examination.

The amount of living and building garbage produced from this project during the Construction Period will be small. They will have no negative impacts on the vegetation and land uses after the end of construction, if properly disposed.

(2) Operation Period

The solid wastes in the Operation Period mainly come from living garbage generated from the staff active areas in the Service Area and other service facilities.

In the Operation Period, environmental sanitation departments will clear the garbage on both sides of the highway, and the impact of the solid wastes on the surroundings will be very small.

2.2.5.8 Pollution Risk Analysis for Dangerous Goods

After the highway is put into operation, there will be possibility of traffic accidents. For the vehicles loaded with toxic, harmful, inflammable or explosive matters, in particular, once the traffic accident happens, the impact on the environment will be great. Considering that the risk of dangerous goods transportation is the emergency of traffic accidents, it can be prevented through certain management measures. In order to timely control possible occurrence of accidents, fire control institutions should be set up with professional personnel and monitoring instruments equipped, in order to timely eliminate and control the pollution.

2.2.5.9 Accumulative and Indirect Impact Analysis

(1) Accumulative impacts

The main environmental problems of the network construction include: social environmental impact, water environmental impact, ambient air impact, noise environment impact and ecological impact in both construction and operation periods.

Considering that the network will be constructed on the base of existing natural roads or sand gravel roads, the new occupation of land will be small. The roads will be dispersive, and the accumulative impacts will be small.

(2) Indirect impacts

The construction of the proposed project will lead to change of industrial structure and economic types in the project area and finally bring about indirect impacts on the regional environment.

It is suggested that the new building and expanding of the enterprises in the project area should strictly implement the system of EIA, to ensure the pollutant discharge in compliance with the standards. The current water quality of the Hailar River in the drought period is serious; the comprehensive control plan has been developed. The water quality will be obviously improves as various treatment projects have been initiated in succession.

As about 13km of the road will be built passing across the erka wet land, the building of the road will naturally benefit the development activities at the fringe of the wetland. The development may not directly reduce the area of the wetland, but it will surely impact the function of the wetland, will reduce the activity area of animals in wetland. Strictly policy must be made by the government to restrain the development. This policy will cover the protected scope of the wetland. No development is allowed within the scope. Limited requirement will also be given to the development at the fringe of the wetland to ensure the environment impact is acceptable. As known, this policy is under planning nowadays.

2.2.5.10 Traffic Safety Analysis

The crosswise interference along the current highway line is less, the running speed is fast and the pavement is relatively narrow, and vicious traffic accidents have happens frequently.

After the expansion of Hailar-Manzhouli highway section, the highway will be of Class I, the communication conditions will be greatly improved, traffic safety be enhanced and trffic accidents be reduced.

2.2.6 Erka Wetland Environmental Impact Analysis

2.2.6.1 Impact on ecological integrity of wetland

The main impacts of the highway construction on the wetland are reducing the area of wetland by going through the wetland; decreasing the connectivity of the wetland.

2.2.6.2 Impact on vegetation

The scope of perturbation on the wetland vegetation and soil by temporary land occupation of the proposed highway will be within 50~100m along the line.

Suppose that the impact area is within 100m on both sides of the highway, the total impact area will be 264ha, or 0.31% of the total area of Erka Wetland.

2.2.6.3 Impact on wild animals

□1□Construction Period

During the Construction Period , the construction of bridges will have direct unfavorable impact on the varieties and quantities of amphibians, reptiles and fish along the line, making them migrate to surrounding areas with less interference and adapt to and live in the new environment.

In the region of Erka Wetland, there are few large and medium wild animals. The construction of the highway during the Construction Period may affect the ways of migration, scope of feeding and the habits, but as the large and medium mammals have been few, the impact of highway construction on them should be low.

□2□Operation period

The highway line will go through the wetland for a length of 13.2 km. According to local hydrological conditions, 8 big and medium bridges and some culverts will be set up.

The mechanical noise, human activities and vegetation destruction in the Construction Period will all affect the habitation and breeding of birds in the construction zones and nearby areas, making obvious change of varieties and species of the birds in the region. It will have no obvious negative impact on the hydrology at the wetland section, and thus only have small impact on the fish.

The amphibians and reptiles are widely distributed in the project area, and their own activity scope is small. The bridges and culverts built over the rivers and ditches in the wetland area can serve as the passage of the amphibians and reptiles for their inter-communication. Therefore, the operation of the project will not lead to the migration obstacle of activities of the amphibians and reptiles and the resulted species decay.

There are a very small number of large and medium wild animals along the highway line. Among the large and medium mammals that are acting along the line are most domestic breeding animals, such as horse, cow and sheep, etc., which activities can be guaranteed by setting up bridges and culverts and specific passages to alleviate the negative impacts. In

addition, the impact on the domestic animals may become less when they get used to the new environment in some time.

After operation of the highway, the traffic noise will permanently affect the animals nearby. The noise from the running vehicles can directly scare and disturb the birds and other animals in the region, having certain impact on their habitation and breeding. This may force some birds to flee away from the region, resulting in reduction of animal varieties and quantities along the line. The bird impact is within the scope of 100m along the highway, the impact area about 264ha, or 0.5% of the total wetland area.

2.6.2.4 Experts' comments and suggestions

Three experts and one were employed during the preparation of the EIA Report . Two Inner Mongolia gave the following comments and suggestions.

Integrating the two experts' comments on the impact of the project on water fouls, it can be concluded that the highway construction will have some impact on the habitats and breeding activities of Cygnus Cygnus and Anthropoides uirgo. To most grass birds of prey, the main influence is that their habitation will be disturbed by the reciprocation of the vehicles. But when considering the little amount of traffic flow at night, the impact on birds is limited. As most key protective birds have multiplicity in their food source, the impact on food seeking due to the plants destroying along the line is very small. But the highway construction will have the effect in dispersing the bird along the line temporarily.

Martin Williams (international environmental consultant)

1. Protection of the wetlands

(1) The Manzhouli government will make a wetland protection plan before the operation of the highway, in which it land use planning will be introduced, i.e. zoning, to ensure that there are no highway-related developments that damage the wetland – especially on the fringes, i.e. lands that are rarely or never flooded.
(2) During the operation period, the Manzhouli government ensures that its environment department will examine all the development arising from the highway if it has any adverse impacts to the wetland and will impose necessary mitigation measures if necessary.
(3) The Manzhouli government ensures that its environment department will patrol the wetland to ensure there is no hunting both during the construction and operation period.
(4) Important small lakes/ponds near the Erka Wetland will be included in the wetland protection plan.
(5) The PEO will ensure the similar mitigation measures at the other wetland area during construction work.
(6) The speed of the vehicle will be limited lower in the wetland area.

2. Wetland observing facility

In order to provide people opportunity to observe and learn about the ecology of the wetland, a good visiting place for observation will be identified and IMCD will invest necessary facilities including the following. The environmental department of the Manzhouli government will be involved in the development of these facilities.

(i) Artificial bird nest sites could be introduced – such as floating and/or elevated platforms

(ii) Parking lots for about 10 vehicles, which should be no damages to the wetland,

(iii) Narrow wooden path over the wetland

(iv) Education, information, and signing boards

3. Special Ecological Monitoring

According to EAP, a special ecological monitoring will be conducted for the Erka Wetland three years during construction and three years during operation periods and this monitoring plan will include the following components.

(1) Assessments will be made regarding whether birds are killed by vehicles traveling the highway across Erka. If so, speed restrictions can be introduced; and maybe helped by speed bumps.

(2) Monitoring will be made regarding introduction of new power lines or telephone cables beside the highway. If so, measures will be taken to ensure birds do not fly into them (and perhaps die).

The experts have some suggestions on the environmental protection measures as follows:

(1) Management should be strengthened in the Construction Period. Before the construction, construction access roads should be constructed and construction vehicle route properly defined to forbid their arbitrary driving. During the construction, the construction scope should be specified and any constructive activities should be controlled strictly within the scope, and the destruction of vegetation around the construction areas is prohibited. In the Construction Period, the forest and plants on the requisitioned lands especially the plants in sandlot should be protected as far as possible.

(2) After the end of construction, each part of the destroyed area due to the project construction should be leveled, loosened by plough as soon as possible. In proper seasons, tree species and grass seeds, which are suitable to the local ecological environment, should be cultivated to recover the natural landscape. Toward the destroyed arbors and shrubs due to the construction, compensation rules should be established and should reflect the practical loss. In-situ or allopatric compensation is regarded as the best method.

(3) During the highway construction, all the construction activities should avoid the wild animal's habitation and the behavior disturbing or destroying the wild animal's living area is not allowed. Excessive catching and hunting wild animals is forbidden. The construction time

should avoid the season like gale in the spring. The construction efficiency should be enhanced to shorten the construction time. It is also important to minimize nudation and the destroying of natural vegetations.

(4) When the highway construction is finished, unified arrangement, clearance and renovation are needed for the temporarily occupied lands and the affected areas due to the construction. According to the different land situation and local ecologic environmental plan along the highway, corresponding measures are asked to taken to recover the vegetations and prevent desertification. The measures taken should be differentiated by the different types of occupied land when recovering the vegetations and prevent the desertification. If it was farmland before, it should be reclaimed to farm; if it was grassland before, the emphasis is to recover the previous vegetations; if it was fixed or semi-fixed sandlot, the main task should be recovering the previous vegetations. Mechanical sand barrier is the main way for flowing sandlot, in combination with shrubs and herbs growing in sand, so as to recover the previous vegetations, prevent the desertification, while improving the ecological environment along the highway.

(5) Eco-toutism could be developed at the part of the road in wetland, measures should be considered for this.

Development at the fringe of the wetland should be well controlled to protect the wetland.

2.2.7 Total Amount of Newly Increased Water and Soil Erosion

Based on the analysis of the origins, types and distributions of water and soil erosion in the project construction for the recommended lines, and the calculation of the area occurring water and soil erosion and the projection of the water and soil erosion intensity, the soil erosion amount to be potentially produced during the Construction Period is determined as 128803.8 tons, the original landform soil erosion amount 31031.3 tons, and the newly increased soil erosion amount 97772.4 tons.

2.2.8The Physical Distribution Center

2.2.8.1 Social environmental impact

After the construction of the PDC, it can provide services of goods transfer and storage, favorable to the border trade between China and Russia and Mongolia. The construction of this PDC will bring about long-term favorable impacts for the regional economy.

The construction of the PDC will increase the employment opportunities.

The current site for PDC is blank, without need of migration and removal for the center.

Duo to the goods transportation, there will be an increase of 100~150 vehicles (calculated by large freight vehicles) of daily traffic flow.

2.2.8.2 Water environmental impact

The wastewater is discharged into Hailar MWWT Plant, with the treatment capacity of 20000t/d, through the municipal sewer system.

2.2.8.3Air environmental impact

The main pollutants include smoke dust, SO_2 and NO_x. The emission of this project is small and will have small impact on the regional air environment.

2.2.8.4 Noise environmental impact

The noise sources of the PDC in the Operation Period are mainly operational noise of boilers and pumps, etc. and running noise of transportation vehicles.

By adopting the above measure, the noise impact on the engineering area can be reduced to ensure the compliance with the national plant boundary noise level limits.

2.2.8.5 Solid waste impact

The solid wastes generated from the engineering include waste package and living garbage, etc. The solid wastes will be collected by classifications. The wood boards, paper boards and other recoverable goods will be collected for sale, while the garbage that cannot be recovered will be collected and disposed periodically by municipal departments.

2.2.8.6 Indirect impact

(1) Water environmental impact

The tail gas from the freight vehicles could be washed by the rainfall into the Hailar River. As the PDC-induced traffic flow is not high (100~150vehicles/d), and the river water flow in the rain seasons is great, the impact on the water body is small. It will also stop immediately after the rain stops, thus belonging to short-term impact.

(2) Air environmental impact

The projected NO_x concentration nearby the highway at Tuanjie Village section will not exceed Class 2 of GB3095-1996 in the Operation Period (target year 2013).

(3) Noise environmental impact

After the construction of the PDC, the noise level in the daytime at the residential houses of Tuanjie Village on the side of the highway will be near to the national standard value, while that at night exceed the national standard. Therefore, the residential houses within 35m to the highway sides should be removed. According to on-site reconnaissance, 5 households will be removed, and the total removal cost 100,000RMB.

2.3 Overall Conclusions

The construction of Hailar – Manzhouli Highway will have outstanding socioeconomic benefits and thus have been widely supported by the public. The routing of highway line is reasonable, with the route avoiding cities and towns such as Hailar District, Bayankuren Town, Zalainuoer Mineral Area and Manzhouli City. In the Operation Period, the impact of the project on the life of people is mainly noise impact. Duo to the geographical position, the line has to go through Erka Wetland, which may generate some impact on the wetland ecology. It is suggested that environmental prevention and control measures be implemented in accordance with the environmental protection program, including implementation of highway conservation works, water drainage works, overall greening scheme, rehabilitation of vegetation in temporary land uses, and demolition and moving of nearby houses. This can effectively protect human living environment in the area along the line, and control the impacts on soil erosion and the birds.

In a word, the construction of this proposed project is feasible in respect of environmental protection.

3. MEASURES FOR ENVIRONMENTAL PROTECTION

3.1 Measures for Environmental Protection in Design Phase

3.1.1 Social environment

(1) The lines avoid passing major environmental sensitive sites (Hailar District, Chenbaerhu Qi, Zalainuoer Mineral District, and Manzhouli City)

(2) The pavements and tractor roads should be considered in the engineering design to facilitate herdsmen walk and tractors passage and thus reduce the impacts of the highway on mutual isolation.

3.1.2 Surface water environment

(1) The bridges and culverts should be rationally built to prevent blocking water stream and ensure surface runoff, and prevent resulting in flood disasters.

(2) The domestic sewage and production wastewater in the service areas should be treated. It is suggested that the oil-insulating treatment for wastewater containing oils be performed, and the septic tanks for domestic sewage be built. The process flow diagram recommended is shown in Figure 3-2.

3.1.3 Ambient air

(1) The temporary facilities, such as blending stations, bitumen mixing stations, should be built, according to the local dominant wind directions and sub-dominant wind directions, to the leeward and at places beyond 200 m away from the sensitive sites, such as resident areas, hospitals, etc. (K404+000, K409+700, K493+400, K505+500, K557+800). And the blending stations should have good sealing property.

(2) It should be prohibited to build the temporary facilities, such as blending stations, bitumen mixing stations, in Huhenuoer Lake (K430+000-K438+000), Benpo Lake (K526-K532), and Erka Wetland (K540+000-K553+200).

3.1.4 Noise environment

(1) The materials sites, blending stations, and bitumen mixing stations should be built away from resident areas, hospitals, Huhenuoer Lake, Benpo Lake, and Erka Wetland (K404+000, K409+700, K493+400, K505+500, K557+800, K430+000-K438+000, K526-K532, K540+000-K553+200) at distances of more than 200 m.

(2) The traffic signs to prohibit vehicles from using horns should be established in the areas, such as resident areas, hospitals, Benpo Lake, and Erka Wetland (K404+000, K409+700, K493+400, K505+500, K557+800, K430+000-K438+000, K526-K532, K540+000-K553+200).

(3) There are one hospital and four villages along the lines. The measures (e.g. migration) shall be adapted to reduce the impacts of noise. The villages exceeding noise standards of the long term in 2030 are given in Table 4-4-10.

3.1.5 Eco-environment

(1) In the engineering design, the balance of earth and stone should be reached as far as possible, the mountain areas should be selected as waste earth yards, and occupation of grasslands should be avoided. The earth borrowing yards shall occupy grasslands of high yields as less as possible. And the protection embankments shall be built in the grassland areas to reduce the land occupation.

(2) To protect the grassland tourism resources, it is suggested that the earth borrowing yards and waste earth yards should not be allocated within the fields of vision along the lines and should be allocated on the mountain rear sides, and that soil should be extracted as level as possibly and, then, the recovery measures should be taken and grass should be planted (refer to Figure 2-8 and Table 2-11).

(3) The protection engineering of the road bases and the drainage engineering of the highway should be rationally designed to prevent soil erosion and water and soil loss.

3.1.6 Erka Wetland

(1) The centralized construction sites, such as mortar blending stations, should not be established in the wetland area. The required materials shall be transferred from the construction sites located in other road lines.

(2) In the construction of the road surfaces, the schedule and construction machines should be rationally arranged to avoid construction at nights and centralized construction of the large-scale machines.

(3) The temporary land in the wetland area should be occupies as less as possible to reduce the impacts of the construction on the ecological environment of the area as far as possible.

(4) Cross section should not to allocate the level crosses at the wetland area to prevent vehicles from going down the line.

(5) The signs not to use horns should be established in the road section after the highway is put into operation.

(6) Before the construction, construction access roads should be constructed and construction vehicle route properly defined to forbid their arbitrary driving.

3.1.7 Measures for Water and Soil Conservation

Table 3-1 List of the Measures for Water and Soil Conservation in Construction along the Highway

Phase	Measures for water and soil conservation	Detailed practice	Supervision and implementation institutions
Design Phase	Submission of a detailed water and soil conservation design to corresponding institutions	⌘ Construction schedule ⌘ Measures for water and soil conservation engineering ⌘ Engineering Quantitative Table ⌘ Design Drawings	The Highway Headquarters

3.1.8 Measures For the Physical Distribution Center

(1) Wastewater

The treated wastewater can meet with Class III requirements of *Wastewater Comprehensive Discharge Standard* (GB8978-1996), i.e. COD□500mg/l, oil□20mg/l, and SS□400mg/l. The wastewater is discharged into the sewer system of the industrial estate and treated by Hailar Municipal Wastewater Treatment (MWWT) Plant. The final wastewater discharge can meet with Class I requirements of GB8978-1996.

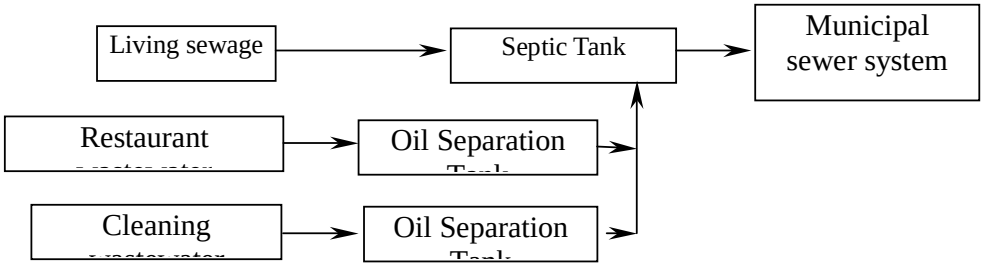


Figure 3-1 Wastewater Treatment Flow Chart at the Physical Distribution Center

(2) Waste gas

The emission of waste gas from the boilers should meet with the standard for Class 2 areas in *Boiler Air Pollutants Emission Standard* (GB13271-2001).

(3) Noise

The equipment with low noise will be selected and the layout is reasonably planned to guarantee that the plant boundary noise can meet with Class III of *Industrial Enterprises Plant Boundary Noise Standard* (GB12348-90).

(4) Solid waste

The solid wastes will be collected by classifications, and the waste packages, leftover materials are recovered or sold to the outside. The solid waste that cannot be utilized will be periodically collected and disposed by environmental sanitation department.

3.2 Measures for Environmental Impact Prevention in the Construction Period

3.2.1 Social environment

(1) Migration

The dismantling and moving volumes of the project will be small. Houses and buildings of 358 m2 shall be required to dismantle and move (refer to Table 4-1-1). Before the construction of the project begins, the Office for Land Imposing and Dismantling and Moving should be founded. The national compensation policies on land imposing and dismantling and moving shall be propagated. The resettlement problems for herdsmen who will be imposed their lands shall be resolved and the buildings to be dismantled and moved shall be compensated. In the migration process, the customs and religious belief of the minority nationalities should be respected.

(2) Shift of Power Transmission and Communication Lines

Before the construction of the project, the coordination work with the power and communication institutions should be actively undertaken.

In the mark sections of the power transmission line shifts, the safety supervisor should be assigned for each mark section. The obvious safety warning lines should be established in the construction sites. And the symbol lights attracting eyes should be installed at nights. The local herdsmen, travelers, and livestock should be prohibited to enter the construction sites.

(3) Local Communication and Transportation

1. Before the construction begins, the local roads to serve as the transportation passageways should be consolidated and remade or the pavements should be built through.
2. In the construction periods, if the roads are required to be partially blocked, the pavements should be built to be connected with the original roads.
3. In the construction periods, if the local roads are damaged, they should be repaired upon the end of the construction, or the reparation should be paid to the locals who shall repair them.
4. The transport vehicles should avoid the local traffic rush hours, reduce their environmental impacts on noise and air in the areas along the lines, and reduce the traffic accidents.

(4) Land Utilization

a. The construction management should be enhanced. The construction practices should be undertaken in the designated construction areas. And the random occupation of grasslands should be prohibited;
b. The construction vehicles shall go on the designated roads and be prohibited to go on the grasslands at random.

(5) Cultural Relics and Historical Sites along Lines

According to the initial investigation, along the reconstruction project route, there are no cultural relics found in the construction. If any cultural relics found in the construction, the building work must be interrupted with the cultural relics control departments noticed. The building work must not continue until the excavation and arrangement are completed.

In the active coordination of the highway building department and the relics protection department, action in accordance with the national laws for protecting cultural relics, the project construction will not produce effects on the cultural relics concerned along the route.

There have to be the articles on the cultural relic conservation and normal work procedures in the tender invitation proposals of each road section of the project. And there should also be the corresponding articles on the supervision and inspection and control of the cultural relics in the tender invitation proposals of the inspection and control.

3.2.2 Surface water environment

(1) Bridge and Culvert Engineering

There are a few rivers along the highway lines to be constructed. They are seasonal rivers. The construction in the cofferdam method should be adapted to effectively prevent turbid water quality produced by the construction, and construction refuse from falling to the rivers to pollute water bodies.

The mud residues excavated from excavation of the bridge piers, and wastewater from washing and brushing construction materials (e.g. sand and stone washing and brushing) should not be

re-discharged into rivers. The temporary precipitation pools should be built to precipitate them, and mud residues should be put at the low-lying sites outside the river embankments.

(2) Machine Work

A. Sewage from construction machines which contains oil should be collected and then treated (collected into waste plastic tanks and then transferred out for treating), and should not be discharged into the water bodies.

B.The stack sites for the construction materials, such as bitumen, oil materials, chemical substances, etc., should be located outside the riverbeds and equipped with canvas for temporarily covering purpose.

(3) Construction Camping Grounds

a. The construction camping sites should not be located beside the water bodies. The sewage from constructors needs collecting and discharging into the cesspit; the feces can be composted as fertilizers for the meadow. The sewage can water the meadow, and arbitrary discharging of wastewater without strict management is forbidden.

b. Each construction worker is required to have the medical and anti-epidemic examination before they enter the construction area. The sanitation and anti-epidemic work should be enhanced in the construction camping sites during the rain season to prevent disease spreading.

c. It should be prohibited that the waste stuff and construction materials are discarded and stacked beside water bodies and wetlands to prevent pollution and block of the water bodies.

3.2.3 Ambient air

(1) Materials Transportation

a. The roads of the materials sites should be frequently sprinkled to maintain the road surfaces moist. When wind speed is higher than 5 m/s, the transportation and load and unload of powdered materials should not be performed.
b. The materials transportation roads and construction sites should be periodically sprinkled (twice a day, each in morning and afternoon respectively), especially near the plaster blend stations, and the road surfaces should be timely cleaned to prevent a secondary raising dust.
c. When transportation of unpackaged materials goes through the grasslands and resident areas, the measures to prevent transportation raising dust should be taken, and the transport vehicles should be going at a speed of less than 40 km/h on the roads; the transportation in a lump way should be adapted for lime, and powdered materials should not be over loaded. The raw materials to easily produce a raising dust, such as cement and lime, etc., should be

stored in an airtight work shed, or a windbreak and waterproof measure should be taken for their storage.

d. The vehicles for transportation of construction materials should be covered to reduce falling apart as far as possible. The transportation of powdered coal ash should be loaded and transferred in a wet way.

e. When going through the areas with a higher population density and the sensitive sites□K404+000□K409+700□K493+400□K505+500□K557+800□K430+000-K438+000□K526-K532□K540+000-K553+200□, the vehicles of materials transportation should decrease their speeds to reduce the impacts of raising dust. Also the signs of speed limits should be established at the sensitive sites/areas where the vehicles of materials transportation go through.

(2) Construction Work

a. The advanced blend equipment for bitumen and concrete should be adapted. And the bitumen melting and mixing should be done in airtight containers. The bitumen preparation in an open simple way should not be used.

b. In the construction of road bases, individual layers should be timely rammed and sprinkled to reduce dust. And the construction pavements and unpaved roads should be frequently sprinkled to reduce dust pollution.

3.2.4 Noise environment

1. It should be done to rationally arrange the construction activities, shorten the construction periods as far as possible, and reduce the impact time of construction noise. The construction machines with big noise should be avoided being simultaneously used in the same area, especially those sites near the noise sensitive sites, i.e. only one machine being used at a time interval within a road section of 50 m. The piling and demolition work shall not be allowed at nights(from.10:00 pm to 6:00 am). The following machines shall be limitedly used at nights: loading machines, vibrators, pounded drilling machines, and concrete mixers with a higher noise.

2. Because there are resident areas, hospitals, Benpo Lake and Erka wetland road sections (K404+000, K409+700, K493+400, K505+500, K557+800, K526-K532, K540-K553+200) near the lines, the construction machines with a strong noise should not be used at nights. (from 10:00 pm to 6:00 am).

3. The workers operating the construction machines and on-site construction persons should control their working hours or take personal protection measures (e.g. with safety helmets and earplugs).

4. The main transportation lines should be away from the sensitive sites, including villages and hospitals, as far as possible.

3.2.5 Eco-environment

(1) Do not expand earth borrowing volume and range of the earth borrowing yards at random, and decrease the excavation surfaces as far as possible; earth should be discarded according to the designed capacity of the waste earth yards, and do not exceed the range.

(2) After the finish of the construction, the temporary construction bridges should be timely removed, and the construction pavements should be cleared away and removed and vegetation should be recovered.

(3) At the earth borrowing yards, the farming mellow soil of the original land surface should be piled up aside and stored before the excavation and, then, filled back and removed after the finish of the construction to recover the original land surface. The construction duration is three years and the annual effective construction duration is only about six months. Because there exists severe wind erosion in the areas, it is suggested to divide up the excavation and assign a part to each in the regional sites and, for the excavated region, to timely carry on leveling work, to cover topsoil, to recover vegetation, and not to wait for the end of the whole engineering to do so.

(4) The residue blocking dams should be built at the waste earth yards. The discarded earth should be stacked in a trapezoid way, the stocked earth and stone should be dammed firmly and the top of the stocked earth should be leveled as far as possible to decrease rain washing and brushing. The blind pipes should be installed and the outer edges should be pilled up with cobble gravels to eliminate permeating water. When the construction is performed at the waste earth yards, topsoil should be firstly stacked aside, discarded earth should be timely and firmly pressed and, after discarded, the top surface should be filled back with mellow soil, with a covering thickness of 30-50 cm, to satisfy the basic requirements of plant growth.

(5) At the materials sites, the stripped vegetation and topsoil should be separately stacked before exploiting. The exploiting ways which minimally change the landforms, such as the whole exploiting or parallel exploiting, etc., should be adapted to avoid producing deeper pitfalls and bigger excavating slopes and to facilitate filling repeat-soil back and recovering vegetation after the work is completed.

(6) For the temporarily occupied lands, the vegetation and farming land recovery should be undertaken as soon as possible after the engineering is completed. It should be done to use

while leveling, greening, and re-farming. For greening work, the locally appropriate plants should be mainly chosen. For seeds, the sheep grass seeds may be adapted. It is suggested that grass seeds be sowed in mid June since there are light winds and good water conditions in the season to ensure a higher germination percentage.

(7) In the construction, the normal driving routes should be determined to prevent vehicles from husking grasslands and persons from trampling at random.

(8) The diverse pollutants to be produced during the construction should be properly dealt with to prevent serious pollution of ecological environment.

(9) In the sandy land area of the eastern coast of the Hailar River, a grass square frame sand-firm method shall be adapted on roadside slopes and side ditches. It is suggested to carry on the closed afforestation on sandy lands along the road lines.

(10) The propagation of the corresponding regulations to the construction persons should be enhanced. The actions to destroy ecological environment, such as fishing and hunting, etc., should be absolutely prohibited.

(11) Trees on temporarily occupied lands shall not be cut down as far as possible.

3.2.6 Wetland eco-environment

(1) In the construction, diverse temporary land should be occupied as less as possible.

(2) In the construction, land should be occupied as less as possible, the normal driving routes should be determined to prevent vehicles from husking grasslands and persons from trampling at random, and diverse pollutants to be produced during the construction should be properly dealt with to prevent serious pollution of ecological environment.

(3) In the construction of the wetland sections, the temporary construction bridges and construction pavements should be built in the properly selected construction durations, and they should be timely removed and cleaned after the construction is completed.

(4) The construction camping sites should not be built in the Erka Wetland. It is absolutely prohibited to discard and stack waste stuff and construction materials beside the wetland to prevent pollution of the wetland.

(5) The environmental management and supervision institutions should be established and strengthened, and the whole process of the project construction should be permeated with

the environmental inspection and control; The national and local laws, regulations, rules, and technical requirements and standards should be observed, and the ecological rules for the construction persons of the project areas and management and operation persons after the project completion should be developed as well. The major contents of the ecological rules include observing the regulations on the natural resources protection and ecological protection, and not undertaking activities which result in disadvantageous impacts on the regional ecological environment, such as farming, fishing, hunting, etc.

(6) In the wetland mark section, at least one engineer of inspection and control should be designated to be in charge of the inspection and control work of environmental protection work.

(7) The construction scope should be specified and any constructive activities should be controlled strictly within the scope, and the destruction of vegetation around the construction areas is prohibited. In the Construction Period, the forest and plants on the requisitioned lands especially the plants in sandlot should be protected as far as possible.

(8) All the construction activities should avoid the wild animal's habitation and the behavior disturbing or destroying the wild animal's living area is not allowed. Excessive catching and hunting wild animals is forbidden. The construction time should avoid the season like gale in the spring. The construction efficiency should be enhanced to shorten the construction time. It is also important to minimize the destroying of natural vegetations.

3.2.7 Solid wastes

(1) It is suggested that garbage cans should be put in every construction area to collect domestic refuse to be generated.

(2) Because of small amounts and simple components of domestic refuse, it may be centrally and periodically transferred and land filled on site.

(3) It is suggested to coordinate with the local administrative institutions on construction rubbish to be generated from dismantling and moving along the highway lines. The appropriate sites of the second party should be determined. In dismantling and moving and road destroying, the surface removing stuff should not be stacked along the lines. Coordinated with the environmental inspection and control in the construction, the proper stack sites should be chosen. The leftover waste materials to be generated in the construction shall be dealt with by the construction units themselves.

3.2.8 Scheme of water and soil conservation

Table 3-2 List of the Measures for Water and Soil Conservation in Construction along the Highway

Phase	Measures for water and soil conservation	Detailed practice	Supervision and implementation institutions
Flat ground excavation	Prevention of washing and brushing of converging water from the upper reaches of excavating surfaces	⌘ Building temporary water-blocking ditches (60 x 60 cm trapezoid ditches) at places of more than 5 m from the upper reaches of excavating slope surfaces	Bidding Contractors
	Stabilization of side slopes	⌘ Adapting grass-planting protection on the side slopes with no more than 4.0 m of heights of earth base and road base side slopes Building walls with starch-laying piece stones in bad areas	
	Other	⌘ In excavation of road base and earth borrowing yards with surface soil, surface soil should be centrally laid aside and properly treated to facilitate to fill back surface soil of the excavating surfaces after the construction and to recover vegetation.	

		In construction during rain season, rustic cloth covers should be prepared for the bare waste earth and stone yards to prevent from producing strong water and soil erosion in flood season. Sludge to be produced from bed-cleaning of wetlands and building of bridge punching stakes should be prohibited from directly entering river courses and wetlands and properly treated.	

Earth-filling road sections	The surplus earth and stone at the other places along the line should be used as far as possible. If purchasing, they should choose those mineral points where there are the approvals granted by the institutions of mineral management, forestry, public security, and environmental protection, etc., and business licenses formally issued. If self-mining, they should apply for the mining permits. The mining without the permission has to be absolutely prohibited.	⌘ Building 60 x 60 cm side ditches with starch-laying piece stones outside the slope-protection roads away from the embankment slope feet, and periodically cleaning sludge and sand deposited inside the ditches ⌘ In the excavation of earth and stone, not damaging the landscapes along the line should be considered, and a hilltop should be completely excavated as the end. After the excavation, the excavating surfaces should be covered with the mellow soil layer and surface soil moved away before the excavation, and the original vegetation should be recovered. ⌘ The side slopes of the excavation surfaces should not be too big. And the treatment should be undertaken for the unstable side slopes.	The Highway Headquarters Mineral and forestry responsible departments

Earth borrowing yards and waste earth yards	It should be used for the vertical allocation of road base as far as possible, not be stacked at random and dumped to the nearby flood lands, be moved to the specific stack sites for storage, be combined with farming and afforestation. And the improved facilities for water and soil conservation should be developed.	⌘ The earth borrowing side slopes should be bigger than 1:1 ⌘ After earth is borrowed, the earth borrowing yards and their surrounded places should be cleaned up, leveled, filled back with mellow soil and, then, herbage should be mixedly seeded. ⌘ The earth borrowing yards should be filled back with surface soil. The soil should be porous. The thickness of the soil layer should be more than 30 cm. The soil types should be grass marshland soil and chestnut soil.	Design institute Local government Corresponding Institutions Bidding Contractors

	Some volume may be locally used, or stacked along the roadsides for planting trees.	⌘ Building the residue-blocking dams (or residue-blocking walls) the section of which is normally rectangular or trapezoid. ⌘ The earth and stone should be stacked in trapezoid forms and rammed as firmly as possible. The top should be flat and neat to facilitate to fill back with mellow soil and recover vegetation and re-plough. ⌘ The discarded earth and stone residues should not be dumped to any places other than the specific waste earth yards. ⌘ The reclamation should adopt soil coverage measures. ⌘ The earth-covering measures for re-plough of the terraces have to be adapted.	
Temporary engineering, such as construction pavements and material supply sites	Building the water-blocking ditches and side ditches to avoid washing and brushing the mud-rock road surfaces.	⌘ The water-blocking ditches should be built on the upper side of the temporary road slopes surfaces ⌘ The side ditches should be built on the both sides or single side of the temporary road surfaces ⌘ The bottom width of the water-blocking ditches and side ditches is 50 cm, the ditch depth 50 cm, and the side slope 1:1	
Greening engineering	recovering vegetation	⌘ Planting strongly drought-resistant and adaptable bushes on the terraces of the road cutting side slopes of the earth-excavating road sections;	Design institute The Project Headquarters

		planting grass on the dirt road cuttings of sandy soil and crashed stone; and building surface-protection walls in the road cutting side slopes of the rock road sections. ⌘ Adapting arched skeleton grassing protection, grassing inside the arched rings, for the soil side slopes of the earth-filling road sections with the height of more than 4.0 m; adapting dry-laying piece stone protection for the water-inundated road sections with the designed water level of less than +0.5 m; and adapting the greening ways of turf slope protection for the lower embankments with side slope earth- filling height of less than 4 m. ⌘ Afforestation on the both sides of the road bases. In the previous year of the afforestation, leveling land and digging tree holes before the rain season; planting trees mainly in spring and fall seasons, pruning roots of nursery stocks before the plant; After the plant, timely irrigating, hilling up, applying fertilizers, pruning, and preventing from plant diseases and insect pests. ⌘ Planting bushes in the central isolation areas, the heights of which are about 1.6 to 1.7 m,	Bidding Contractors

		and planting lawns on ground. ⌘ For greening of mutual grade separation, adapting combination of trees, bushes and flowers, and grass, artistically spaced and interspersed in heights; for the curved road sections, planting trees on the outsides.	
Arrangemen t of thee Constructio n Period	rationally arranging the construction orders	The construction should be undertaken section by section to reduce the lines to be occupied by the construction. In the earlier construction, the road base engineering should be completed with the protection engineering tasks, including slopes protection, drainage, retaining walls, afforestation and grassing, simultaneously. The earth engineering of the next road section should begin upon the finish of the road base engineering and protection engineering of the previous road section.	Bidding Contractors

The Highway Headquarters is in charge of organizing and implementing the water and soil conservation scheme of the project to coordinate the water and soil conservation scheme and the major engineering, to ensure the synchronous implementation, complement at same period, and simultaneous check and acceptance for each of the water and soil conservation design and facilities and the major engineering. The Highway Headquarters should entrust the corresponding design institutions to undertake the engineering drawing design of water and soil conservation. And the corresponding design contents and requirements should be determined in the form of the contract in the construction bidding. In implementation, The Highway Headquarters should supervise the implementation of the water and soil conservation implementation scheme by the bidding and construction institutions, participate and guide the check and acceptance work of the water and soil conservation facilities, entrust the qualified inspection and control agent to undertake the inspection and control, and, simultaneously, accept the supervision of the local forest and water administrative authority institutions.

3.3 Measures for Environmental Impact Control in the Operation Period

3.3.1 Surface water environment

(1) The integrated sewage treatment facilities should be installed in the service areas. It is suggested to adapt the cycle process for wastewater treatment to ensure that wastewater discharged out reaches the second level standard in *Farmland Irrigation Water Quality Standards* (GB5084-1992). The sewage treatment flow diagram suggested is shown in Figure 3-2.

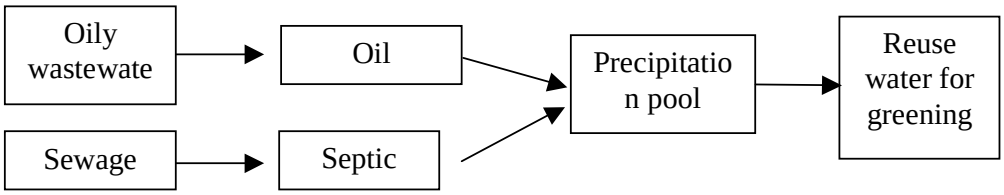


Figure 3-2 Sewage Treatment Process Diagram

(2) The highway fee collection stations should fully play their roles and simultaneously function the inspection and control. It should be absolutely prohibited that those vehicles with any revelation, unpackaged overloading go on the highway to prevent missing goods on the highway from polluting water bodies and wetlands.

3.3.2 Ambient air

Grass shall be planted on the both sides of the highway to clean and absorb pollutants in the vehicles exhausts and, simultaneously, to beatify the environment and improve the landscapes along the highway lines.

3.3.3 Noise environment

(1) Measures for Traffic Noise Prevention and Comparison and Selection
The common noise prevention and control measures are as follows: sound insulation barrier, greening, building removal, sound insulation windows, and engineering avoiding, etc.

According to the ambient noise value of sensitive points, the adoptive noise environmental protection measures will be as follows:

Table 3-3 Noise Environmental Protection Measures

NO.	Sensitive site name	Sensitive site type	Distance to line	Year	Value exceeding the standard dB(A)	Noise prevention and control measure

	Post No.		center (m)		Day	Night	
1	Haotetaohai K404+300	Residen-tial area	44	2030		4.5	The residences near the road install sound insulation windows.
2	The 5th Production Team K409+700	Residen -tial area	46	2030		2.3	The residences near the road install sound insulation windows.
3	West Wuzhuer K493+400	Residen-tial area	76	2030		2.9	The residences near the road install sound insulation windows.
4	Mineral Area Hospital, north enclosure K557+800	Outside hospital in-patient buildings	240	2015	-	4.1	Planting six line trees between the road and the hospital
				2030	5.37	6.27	

(2) Management Measures during the Operation Period

a. Those vehicles exceeding the nationally allowable noise standards should not be allowed to go on the highway. *The Allowable Noise Standards for Motor-Driven Vehicles* (GB1495-79) is listed in the following table:

Table 3-4 Allowable Noise Standards for the motor-driven vehicles (GB1495-79)

Vehicle Type		Allowable Standard dB (A)
Truck	8t□Truck<15t	89
	3.5t□Truck<8t	86
	Truck<3.5t	84
Light Cross-Country Vehicle		86
Bus	4t□Total Weight<11t	86
	Total Weight<4t	83
Car		82

b. The bass horns should be used for all vehicles on the highway. And it should be prohibited to use horns at nights.

c. The traffic management should be enhanced. When vehicles pass through the noise sensitive sites or areas, including Haotetaohai and its fifth production team, West Wuzhuer,

Yihe, Mineral Area Hospital, Erka Wetland, and Benpo Lake, it should be prohibited for the vehicles to use horns.

d. The highway maintenance should be enhanced to maintain the road surfaces at an optimal status.

e. The construction planning along the highway lines should be controlled. The sensitive buildings, such as resident houses, schools, and hospitals, should not be built within 200 m.

f. As mentioned at chapter 4, trees should be planted at the right side of the road when passing by the Mineral Hospital to reduce the noise impact.

3.3.4 Eco-environment

(1) The routine management work for vegetation recovery along the lines should be undertaken: periodically going on a tour of inspection of vegetation recovery and adapting corresponding remedial measures for the sections with bad recovery situation. Each part of the destroyed area due to the project construction should be leveled, loosened by plough as soon as possible. In proper seasons, tree species and grass seeds, which are suitable to the local ecological environment, should be cultivated to recover the natural landscape. Toward the destroyed arbors and shrubs due to the construction, compensation rules should be established and should reflect the practical loss. In-situ or allopatric compensation is regarded as the best method.

(2) When the highway construction is finished, unified arrangement, clearance and renovation are needed for the temporarily occupied lands and the affected areas due to the construction. According to the different land situation and local ecologic environmental plan along the highway, corresponding measures are asked to taken to recover the vegetations and prevent desertification. The measures taken should be differentiated by the different types of occupied land when recovering the vegetations and prevent the desertification. If it was farmland before, it should be reclaimed to farm; if it was grassland before, the emphasis is to recover the previous vegetations; if it was fixed or semi-fixed sandlot, the main task should be recovering the previous vegetations. Mechanical sand barrier is the main way for flowing sandlot, in combination with shrubs and herbs growing in sand, so as to recover the previous vegetations, prevent the desertification, while improving the ecological environment along the highway.

(3) The propagation and education of environmental protection and corresponding legality should be strengthened to increase awareness of ecological environmental protection and cultivate good habits to conscientiously maintain ecological environment.

(4) The functions of the quarantine and obstruction of the border and customs should be further enhanced to stop invading of the invading species, to enhance the entrance check work of

diverse traffic facilities (trains, vehicles, etc.), baggage carried by tourists, and diverse goods, and to prevent accidentally bringing foreign living things.

(5) For the part at Erka of the road, eco_tourism measures should be undertaken. These measures include setting parking area, building path into the wetland and setting instruction boards, etc.

3.3.5 Solid wastes

(1) It is suggested that garbage cans should be put in the service areas to centrally collect domestic refuse. After the domestic refuse is collected by the environmental health institutions, it shall be transferred to the nearby refuse transfer station and then further transferred from the station to the refuse treatment sites. The transportation from the refuse transfer station to the refuse disposal sites should be done by the airtight refuse transport vehicles in order not to result in significant impacts on the surrounded environment.

(2) Because vehicles go through the both sides of the roads along the lines, white refuse will be generated which will result in impacts on the landscape and environment of the both sides of the roads along the lines. It is suggested that the refuse of the both sides of the roads along the lines be periodically cleared away and transferred by the environmental health institutions.

3.3.6 Traffic management

(1) Strengthen the traffic management and provide good driving conditions. Periodically and randomly perform check of vehicles noise and exhausts. If those vehicles do not satisfy the noise and exhaust emission standards, they should be prohibited to go on the roads.
(2) Perform public propagation and education to let public know the vehicle noise and atmospheric pollution and corresponding regulations and policies.

3.3.7 Dangerous goods risks

(1) Implement the report and management system for the vehicles transporting the dangerous goods. Vehicles have to hold the travel permit to be signed and issued by the communication and transportation management institutions in order to go on the roads.

(2) The transport vehicles should be equipped with airtight and solid containers and obvious symbols and fire devices. The carriers should receive the necessary working training.

(3) The transport vehicles should be operated under directing and dispatching by the traffic management persons. Under the meteorological conditions (rain, fog, etc.) under which traffic accidents easily occur, those vehicles should not be allowed to go on the roads.

(4) If possible, also carry on the dynamic monitoring for the vehicles transporting the dangerous goods to facilitate to quickly decide the responses when accidents occur and to timely inform the local fire departments and environmental agencies.

3.3.8Strategy protection measure

The Hulunbeir municipal goverment is now planning to set up a general protection plan of Erka Wetland. The plan aims to determine the scope of the protection area, strengthen the management of land using, and will give limits to human's behavior and economic development within or near the area. The building of this road will be also taken into consideration when making the plan.

4. Environmental Protection Program

4.1 Preparatory Period

(1) Feasibility Study Phase

The environmental protection program of the proposed highway in the Feasibility Study Phase, which is in progress, is shown in Table 4-1.

Table 4-1 Environmental Protection Program of Proposed Highway in the Feasibility Study Phase

Content	Implementation	Administration	Responsible and supervisory authorities	Implementation time
Engineering Feasibility Study	Chinese Highway Engineering Consulting and Supervision Company (CHECSC)	Inner Mongolia Communication Department	Ministry of Communication (MOC); State Planning and Development Commission (SPDC)	May, 2001 -- Dec.,2003
EIA	Chinese Research Academy of Environmental Sciences (CRAES)	Inner Mongolia Communication Department	State Environmental Protection Administration (SEPA); Environmental Protection Office of MOC; Inner Mongolia EPB	April, 2002 -- Feb., 2004

(2) Design Phase

Environmental protection program in the Design Phase is shown in Table 4-2. All the environmental protection requirements in the table have been (or will be) put into effect in design.

Table 4-2 Environmental Protection Program of Proposed Highway in the Design Phase

Design content	Environmental protection requirements	Implementation	Administration	Implementation time
Horizontal design	(1) Keeping away from major environmental sensitive sites. (2) Less occupied grasslands, doing the best to protect grasslands.	CHECSC	Inner Mongolia Communi-cation Department	2002 -2004
Longitudinal design	(3) The project should coordinate with the Overall Development Plans of Hailar District, Chen Qi, and Manzhouli City along the line. (4) The line should keep away from Huhenuoer Lake Tourism and Resort Zone. (5) Reducing borrow, and protecting vegetation.			
Bridges and culverts engineering	(6) Protecting irrigation works. (7) Preventing runoff from being obstructed, to keep surface water unblocked. (8) Preventing flood disasters.			
Pathway and overline facilities	(9) Preventing obstruction to facilitate production and travel of herdsmen.			
Roadbed protection works	(10) Preventing soil erosion			
Highway drainage works	(11) Preventing soil erosion			
Borrow, waste yard design	(12) Easy to transport, reducing the impact on local roads. (13) Borrow and waste yards occupying as less high-coverage grasslands as possible, waste yards selected in mountain area.			
Water conservation engineering	(14) Roadbed protection, preventing water and soil losses. (15) Compensating vegetation loss.	Water conservation unit; Environmental protection design unit		
Soil and vegetation restoration	(16) Vegetation is restored, which is destructed by construction (17) Reclamation or growing grass for the land (including temporary land use, borrow yard, construction camps, etc.) occupied in construction period			

Greening engineering inside highway	(18) Protecting roadbed, preventing soil erosion (19) Compensating vegetation loss (20) Highway sight, side slope greening, central space greening of crossroads			
Service areas, management agencies and toll gates	(21) Setting septic tank and deposition tank, discharge of sewage and waste water reaching the standard. (22) Collecting solid waste and cleaning up regularly.			

4. 2 Construction Period

Environmental protection program of proposed highway in the Construction Period is shown in Table 4-3. The environmental protection facilities in the table will be placed to bidding documents and contracts, etc., which will be implemented in construction and will be considered in final project examination as one of the assessment indicators.

Table4-3 Environmental Protection Program of Proposed Highway in the Construction Period (2005 ~2007)

Environmental problems	Environmental protection measures	Executive agency	Administration	Note
Environmental protection for construction	(1) Environmental protection design in th Construction Period (finished with drawing design simultaneously)	Contractors	Highway Bureau, Inner Mongolia Communi-cation Department Hulunbeier Communi-cation Bureau Chief Supervision Engineer Office	At least 1 supervision engineer takes charge of putting environ-mental protection into effect for each bidding lot.
Cultural relics protection	(2) No county-level or up cultural relics in the assessment area found. But once any cultural relic is found, construction must be stopped immediately, for cultural relic departments to excavated and clean up. The highway construction will be continued when approved by cultural relic departments. It is requested that the items related to cultural relic protection and normative operation have to be involved in the bidding documents for each section, which should also be involved in supervision bidding documents.			
Land resources	(3) The temporary land use (including construction pavement, material yard, construction camps, etc.) should not occupy high-quality grasslands as far as possible. If high-quality grasslands are used, cleaning and land improvement should be done once the construction finished. (4) Construction vehicles will run on designated roads.			
Water environment	(5) Sewage from construction camps is treated to reach discharge standard. (6) Preventing oil and chemicals, etc. from discharging into waters during bridge construction. It is not permitted to thrown away excavated slime sludge to waters or wetlands. (7) Building materials containing hazardous materials, such as bitumen and chemicals, are not permitted to stack near the waters and wetlands, and should adopt effective measurements to prevent rainfall washing.			

Ambient air	(8) Preventing resuspended dust in construction sites: watering at construction highway sections, lime soil mixing site, and major transportation pathways. Keeping material yards and mixing sites at least 200m far away from sensitive sites. (9) Powder materials should be sacked or packed. loose packed is prohibited, and stacked materials should be covered. Only wet fly ash is permitted to transport. (10) When sand, stone, earth, etc. are loaded to trucks, the loading height can not excess the height of truck's side board, with spilling strictly prohibited. (11) Bitumen mixing should adopt close-type equipments, bitumen-mixing sites are at least 200m far away from sensitive sites, and the sites should be located at the down wind of sensitive sites. The bitumen mixing sites are forbidden around K404+300, K409+700, K493+400, K526-K531+500, K505+500, K557+800, and K540+000-K553+200.			
Noise environment	(12) Construction hours are limited. Strong noise construction should be stopped from 22:00pm to 6:00am around Haotetaohai, Fifth team, West Wuzhuer, Yihe, Mineral Area Hospital, Erka Wetland, and Benpo Lake. (13) Material sites, mixing sites, bitumen mixing stations are at least 200m far away from sensitive sites.			
Solid waste	(14) Setting up garbage cans, and regularly clearing or treating/disposing after collecting (one place for each bidding lot). (15) Construction wastes and construction refuses, etc. can not be dumped to near the waters and wetland, and should be cleared or treated according to related rules.			

Ecology environmental	(16) The borrow depth in borrow yard (ground height) can not be lower than underground water level to facilitate vegetation rehabilitation. (17) Temporary land use, such as construction pathway and mixing sites, etc. has to be cleared, leveled and restored with vegetation once construction finished. (18) The construction vehicle driveway should be controlled, and various pollutants treated properly. The dissemination, training and supervision for construction workers should be strengthened. (19) Protecting wild animals and plants, and prohibiting hunting.			
Wetland	(20) Reducing temporary land use as much as possible. (21) Construction pathways and temporary bridges should be cleaned up in time after construction finished. (22) Prohibiting set-up of construction camps, mixing stations, etc. (23) Treating various wastes properly. (24) Environmental supervision is carried out by supervision engineer.			
Safety	(25) Construction vehicles should be stopped or reduced in the rush hour of local roads to reduce traffic jam and prevent traffic accidents. (26) Safety staff, safety label and caution lights should be set up in construction site.			
Existing Traffic	(27) Temporary access roads can be constructed when existing local roads are obstructed by the construction. (28) Local roads damaged in the Construction Period should be repaired by contractors. The contractors can also offer make compensation to local governments for the latter to repair in time after the construction finishes. (29) Covering the vehicles, and prohibiting dropping of materials and polluting of local roads along the line.			

Road facility	(30)Wastewater treatment facility should be set for the effluent from office, motel, restaurant and gas station. (31) Emergency facility also should be adopted. (32) Solid waste should be collected by classifications, and disposed by sanitation department.			

4. 3 Operation Period

Environmental protection program of the proposed highway in the Operation Period is shown in Table 4-4. The environmental protection facilities in the table will be the base of compiling environmental protection program in the Operation Period and will be implemented.

Table4-4 Environmental Protection Program in the Operation Period for Proposed Hailar-Manzhouli Highway

Environmental protection work	Main content	Executive agency	Administration	Implementation time
Environmental management	(1) Daily environmental management. (2) Maintenance of environmental protection facilities.	Inner Mongolia Highway Bureau; Contractors	Environmental Protection Office, MOC; Inner Mongolia EPB; Hulunbeier EPB	2008 –2030
Water environment Environmental Hygiene	(3) Treatment of sewage from service areas. (4) Treatment of sewage from divisions and toll gates; septic tank and its treatment. (5) Cleaning up of solidwaste, garbage from garbage cans or cesspits in the service areas, divisions, and toll gates.			Completed before 2008 2008-2030 in normal operation
Air	(6) The emission of dedustors of heating boilers in service areas reaches the standard.			
Soil erosion; Road looks and landscape	(7) Greening maintenance inside the highway. (8) Maintenance of greening around overpass.			
Soil and water conservation	(9) Improvement of temporary land use in the Construction Period, and vegetation rehabilitation for landscape greening. (10) Improvement of borrow yard, and rehabilitation of vegetation.			2008 –2030

Land Use Management	(11)Supervise the developing activities at related area	Inner Mongolia Highway Bureau	Hulunbeier Municipal Goverment	2008-

5. Environmental Monitoring Program

5.1 Environmental Monitoring Program in Construction Period

Environmental monitoring sensitive sites, items and factors, frequency and implementation organization, etc. are shown in Table5-1.

Table5-1 Environmental Monitoring Program in Construction Period(2005-2007)

Monitoring site	Monitoring items				Note
	Surface water	Ambient air	Noise	Ecology	
Haotetaohai		□	□		(1)Inner Mongolia Communication Department. (2)The monitoring results are submitted annually to Environmental Protection Office and the construction unit.
Haotetaohai Fifth team			□		
West Wuzhuer		□	□		
Yihe			□		
Mineral Area Hospital			□		
Erka Wetland	□	□	□	□	
The Hailar River	□				
The Xinkai River	□				
Earth Borrow Yard				□	
Temporary land use				□	
Requirements for monitoring indicators and frequency	(1) Surface water: COD, PH, SS, oil, 1time/2months and 1 day per time in the Construction Period of bridges. Background value should be measured one month before construction period.				
	(2) Ambient air: TSP; 1 time/2 months, 1 continuous day monitoring per time.				
	(3) Noise: construction noise, 1day for every month, 2~3 times for each day. Random monitoring is available.				

	(4) Ecology: Erka Wetland indicators -- plant community (community height, community coverage, community biomass), animal monitoring, soil monitoring (pH□organic matter, heavy metal), insect pest monitoring. Borrow yard and temporary land use indicators -- plant community and soil monitoring. Before the start of construction, the background monitoring is performed (July and August), and during the construction, the monitoring is performed once a year. In the ecological monitoring, local environmental experts will be invited to join the ecological survey. The ecological quality will be independently published, and once the problems are found, emergency measures can be adopted timely.	

Note:"□" means the factors should be monitored (same below).

5.2 Environmental Monitoring Program in Operation Period

Environmental monitoring sites, items and factors, frequency and implementation organization, etc. are shown in Table5-2.

Table5-2 Environmental Monitoring Program in Operation Period (2008-2010)

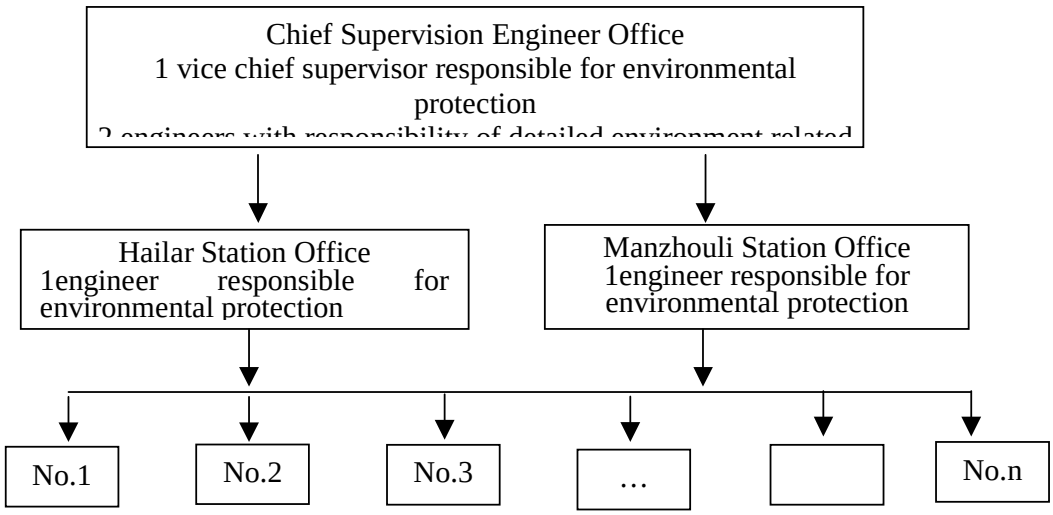
Monitoring site	Monitoring item				Note
	Surface water	Ambient air	Noise	Ecology	
Haotetaohai		□	□		(1)Inner Mongolia Communication Department (2)The monitoring results are submitted annually to Environmental Protection Office.
Haotetaohai Fifth team			□		
West Wuzhuer		□	□		
Yihe			□		
Mineral Area Hospital			□		
Erka Wetland	□	□	□	□	
The Hailar River	□				
The Xinkai River	□				
Earth Borrow Yard				□	
Temporary land use				□	
Requirements for monitoring index and frequency	(1) Surface water: COD, PH, SS, oil, 1time per year, 1 day for each time.				
	(2) Ambient air: TSP; 1 time per year, 1day for each time.				

	(3) Noise: 1 time per year, 1day for each time, 1~2 times both in daytime and night.	
	(4) Ecology: Erka Wetland -- plant community (community height, community coverage, community biomass), animal monitoring, soil monitoring (pH, organic matter, heavy metal), insect pest monitoring. Borrow yard and temporary land use -- plant community, soil monitoring. In the Operation Period, the monitoring is performed once a year. In the ecological monitoring, local environmental experts will be invited to join the ecological survey. The ecological quality will be independently published, and once the problems are found, emergency measures can be adopted timely.	

6 Environmental Protection Institutions and Personnel Training

6.1 Environmental Protection Institutions and the Functions in the Construction Period

The structure of environmental protection institutions in the Construction Period is shown in Figure 6-1.



Note: One supervision team should be set up for each bidding lot, in which a supervision engineer is responsible for environmental supervision

Figure 6-1 Frameworks of Environmental Management Institutions in the Construction Period

The major functions of institutions in the Figure 4-1 are as follows:
(1) Chief Supervision Engineer Office: A vice chief supervisor is responsible for environmental protection decision related to Hailar - Manzhouli Highway in the Construction Period; Two engineers are responsible for environmental protection supervision, implementation organization, and summarization of monitoring data and related materials respectively for Hailar and Manzhouli sections. This office is directly accountable to Inner Mongolia Communication Department and Environmental Protection Office.

(2) The Highway Station Offices from Hailar to Manzhouli: An engineer will guide and take charge of environmental supervision, and environmental monitoring for each bidding lot, and directly deals with environmental protection affairs related to construction.

(3) Bidding lots: A supervision engineer will take charge of total construction process environmental supervision to ensure that the environmental measurements in the construction bidding documents will be implemented.

6.2 Environmental Protection Institutions and the Functions in the Operation Period

The structure of environmental protection institutions in the Operation Period is shown in Figure 6-2.

The major functions of institutions in the Figure 4-2 are as follows:
(1) Environmental Protection Office, Inner Mongolia Communication Department: responsible for environmental protection management of highways in the autonomous area (including Hailar-Manzhouli Highway), setting up annual monitoring schedule and environmental protection measurement program, and formulating regulations and rules related to environmental protection of highway, etc.

(2) Inner Mongolia High-grade Highway Bureau: 1 vice director takes charge of high-grade highway (including Hailar-Manzhouli Highway), there are two sub-branches, Chen Qi Management Agency and Zalainuoer Management Agency, for Hailar-Manzhouli Highway. One deputy chief of each agency directly takes charge of implementation of environmental protection program in operation period and assists Environmental Protection Office to carry out regular environmental monitoring.

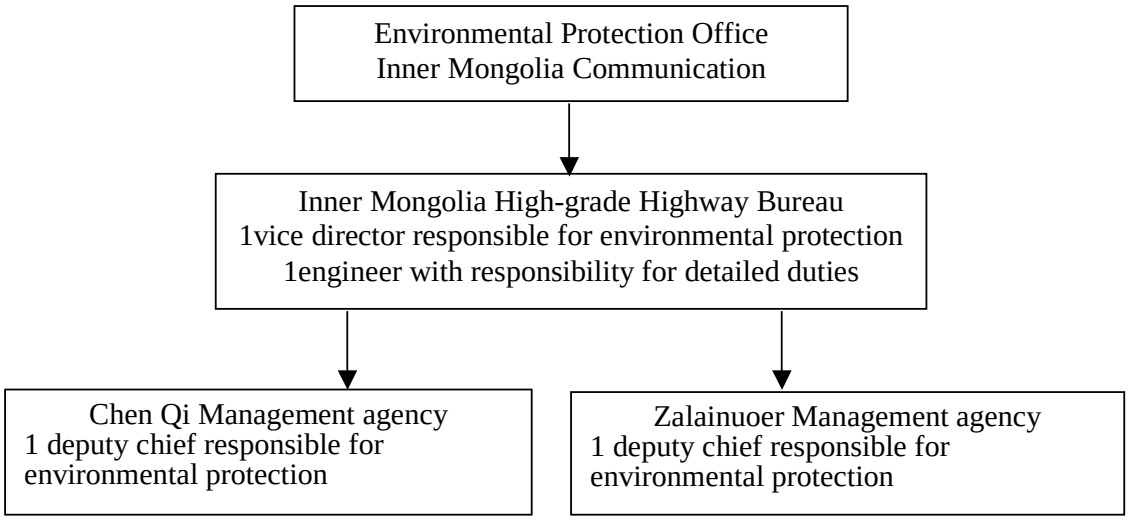


Figure 6-2 Frameworks of Environmental Management Institutions in Operation Period

6.3 Personnel Training Program

The staff who takes charge of environmental protection in Inner Mongolia Communication Department and related bureaus should be training based on the requirements and rules of national environmental management. Personnel training program for proposed Hailar-Manzhouli Highway is shown in Table 6-1. The staff, mentioned in the table, related to environmental management should have some professional environmental protection knowledge.

Table6-1 Personnel Training Program for Proposed Hailar-Manzhouli Highway

Classification	Trainee	Amount (person)	Duration	Cost (10,000 RMB)	Content
High-level study tour	(1) Staff in charge of environmental protection, Chief Supervision Engineer Office, and Environmental Protection Office of Communication Department, and highway companies	1-2	15days	20	(1) To study environmental protection management, regulations and standards related to highway at home or abroad (2) To study new technology and its development trends related to highway environmental protection
	(2) Directors, chiefs, managers related to environmental management, environmental supervision	2-3			
Environmental protection knowledge or environmental monitoring training	(1) Staff related to environmental supervision in the Construction Period (2) Contractors	15-20	30days	30	To study environmental supervision regulations and techniques; environmental

training workshop	(3) Staff from High-grade Highway Bureau	20			environmental monitoring regulations and techniques; environmental management regulations; environmental protection techniques, etc.
Total				50	

Note: The training should be arranged before the Construction Period.

7 ENVIRONMENTAL PROTECTION EXPENDITURE ESTIMATE AND COST-BENEFIT ANALYSIS

7.1 Environmental Protection Expenditure Estimate

According to the environmental protection program, environmental monitoring program and personnel training, etc., the estimate of the environmental protection expenditures of the proposed project is shown in Table 7-1. All the expenditures will be accounted in corresponding documents ("funding source" column) to facilitate implementation. Considering that water drainage and roadbed engineering has been listed in the Feasibility Study Report as the main engineering expenditure, except for these two measures, the total amount of environmental protection expenditures will be 10.863 RMB, accounting 0.5% of the total investment of the project.

Table 7-1 Estimate of Environmental Protection Expenditures

Phase	Environmental measure	Expenditure (10^4RBM)	Funding source	Executive unit	□□
Design Phase	(1) Environmental protection design	50	Preparatory work fee	Environmental design unit	
	(2) Environmental protection program in the engineering design (Table 10-2)			Environmental design unit	
Construction Period	(3) Roadbed protection works	1560	Project engineering cost	Engineering contractors	Already listed in project main engineering
	(4) Water drainage works	5691			
	(5) Greening (planting)	177.8			
	(6) Water spraying at construction site	250			
	(7) Construction wastewater sediment tanks	10			
	(8) Materials transport	50			
	(9) Septic tank at construction camps	5			
	(10) Garbage cans or cesspits at construction camps, garbage clearing	15			
	(11) Safety marks and night lights at construction sites	15			
Environmental protection	(12) More sound insulation windows and greening to decrease noise if exceeding the standard	16	Reserved environmental cost or engineering cost	Environmental Protection Office of Communication Department	40000RMB /household

	(13) Sewage treatment in the service area	20	Civil work cost of the facilities along the line	Highway Administration Bureau Contractors	50000RMB /site
	(14) Septic tanks at management agencies, toll gates, maintenance stations	20			
	(15) Garbage cans at management agencies, toll gates, maintenance stations	10			
	(16) Maintenance of greening works within the highway line	30	Project engineering cost	Highway Administration Bureau Contractors	
	(17) Grass grids and seed sowing at temporary land use, earth borrow and waste earth yards	77.5			
Environmental monitoring and management	(18) Environmental monitoring in the Construction Period	115	Project engineering cost	Communication Department Environmental Protection Office	
	(19) Environmental management in the Construction Period	30			
	(20) Environmental monitoring in the Operation Period	15	Road maintenance cost	Environmental Protection Office of Communication Department OR Highway Administration Bureau	
	(21) Environmental management in the Operation Period	40			
	(22) Maintenance of Environmental facilities	50			
	(23) Personnel training	50		Communication Department	
	Total	8297.3	Accounting for 0.5% of total investment (excluding roadbed protection engineering and water drainage engineering costs)		

7.2 Environmental Protection Measures and Benefit Analysis

An analysis of the main environmental protection measures and the benefits is shown in Table 7-2. According to the table, the environmental protection measures recommended in this EIA are technically and economically reasonable and feasible.

Table 7-2 Main Environmental Protection Measures and Benefit Analysis

Recommended measures	Cost (10^4RMB)	Function	Benefit
Sewage treatment at the service area	20	The treated wastewater being discharged or reused for greening; protecting water environment	Protecting water environment and environmental hygiene
More sound insulation windows and greening to decrease noise if exceeding the standard	16	Reducing noise impact on residents, and improving their living conditions	Implementing *Noise Pollution Prevention and Control Law*
Solid waste treatment and septic tanks	30	The sewage amount being small and septic tanks able to meet with treatment requirements; Collecting and clearing solid wastes	Protecting environmental hygiene and water environment, to form high-quality environment along the highway
Water and soil conservation, land arrangement and vegetation rehabilitation at earth borrowing and waste earth yards and at temporary land uses	77.5	Having comprehensive functions of preventing soil erosion and protecting eco-environment	Preventing water and soil erosion, protecting land resources
Greening of highway and overpasses	177.8	Having comprehensive functions of preventing soil erosion, stabilizing roadbed, improving the eco-environment and ambient air, beatifying road landscape, etc.	(1) Stable roadbed having economic benefits (2) Improving regional eco-environment along the line (3) Economically reasonable and having good environmental benefits

7.3 Implementation of the Action Plan

Before the project bidding, the EIA reports and Action Plan should be dispatched to tendering units as the tendering documents. The tendering units will formulate the tendering documents according to the environmental protection program. While Inner Mongolia Department of Communication signs the contract with the construction contractors, the Environmental Action Plan should be put as an annex to the contracts.

In the construction process, specific staff should be guaranteed to take the charge of environmental protection for each construction section. Before the construction, environmental protection training should be provided to these staff responsible for environmental protection. Inner Mongolia Department of Communication should organize the construction environmental protection staff to hold workshops to discuss and understand the environmental protection status along the highway line and the environmental measures to be adopted. Also, the construction environmental protection staff should provide environmental protection training to the construction workers.