National Road Project III in Hubei Province

Environmental Action Plan

Hubei Provincial Communications Department
Wuhan, China
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1. Introduction

This environmental protection action plan is prepared to implement the environmental protection measures set forth in the “Statement of Environmental Impact Assessment for the National Road Project III in Hubei Province”, to prevent or mitigate the negative impact caused by the project.

This action plan is made based on the features and concrete situations of the construction project as well as the reference materials provided by the World Bank.

1.1 Main conclusions of the EIA report

(1) Air

The current status of the air quality along the proposed road area is fairly good, with the concentrations of NOx, CO below the class II air quality standard level limit. The concentration of TSP is also below the standard level limit, except for that at individual sensitive spot (Liuwan Primary School).

After the proposed road put into operation, the measured concentration of CO along the areas within a distance of 200 m from the road, in the short term (by the year of 2000), the mid term (by the year of 2010), and the long term (by the year of 2020), are below the standard level limit. The concentration of NOx will be below the standard level limit in the short term; in the mid and long term, the concentration of NOx will also be below the standard level limit except that at the Jinkou Pharmaceutical Factory, Baoxie, Liuhuan Primary School and Xinfu Primary School, which will be over the standard limits.

(2) Noise

Investigations show that the current status of the acoustic environment along the proposed road area is good, with both of the daytime and nighttime noise level below the standard level limit.

After the proposed road put into operation, the noise level will be over the standard level limit in different extent for the main route 21% of the 14 sensitive spots in daytime, for 79% of the 14 sensitive spots at nighttime by the year of 2000; the noise level will be over the standard level limit in different extent for the main route 21% of the 14 sensitive spots in daytime, for 93% of the 14 sensitive spots at nighttime by the year of 2010; the noise level will be over the standard level limit in different extent for the main route 43% of the 14 sensitive spots in daytime, for 93% of the 14 sensitive spots at nighttime by the year of 2020. The noise level will be slightly over the standard level limit for 3 of the 6 sensitive spots of the connection road by the year of 2020.

(3) Ecological environment

According to the survey along the proposed road area, the surface water quality, land use, vegetation, farmland soil, growth of the crops are in good condition. In the
area within 500 meters from both sides of the road, no rare animal or plant lawfully protected by the state has been found.

The construction of the proposed road will last 3.5 years, with several rainy seasons. A total of 2146900 m$^3$ earth and stone work will have to conducted in the construction period for the subgrade construction, with great amount of cutting and filling as well as the ground base treatment for some road sections. Therefore the surface vegetation damage, landform transformation and more soil erosion will be inevitable during the construction period.

The land occupation for the road includes the subgrade, earth borrowing site, spoil area, and other temporary occupation area, therefore, there will be impact on the farm land crops.

In the road construction period the impact on the surface water mainly arises from bridge construction, including the impact on river water quality caused by the bridge substructure construction and the sewage from the labour camp.

The impact on the ecological environment during the operation period mainly comes from the vehicle emission of lead. The impact of the flying dust on the crops will be small due to the fact that the area is abundant of rainfall, usually heavy and long lasting raining. The analysis and forecast of the lead pollutant content in the soil show that by the year of 2020, the lead pollutant in the soil on both sides of the assessed road area caused by the vehicle emission will be far less than the critical content level for the soil to bear.

As mentioned above, the major environmental impact caused by the proposed road project includes the noise impact on the noise sensitive areas of Xinfu Primary School, Liuhuan Primary School, Hanyang No. 3 Second School, Liuwan Primary School and several other resident areas in the short term, mid term, and long term of operation period; and the air impact on the air quality sensitive areas of Jinkou Medical Plant, Baoxie, and Liuhuan Primary School in the mid and long term operation period.

1.2 Regulations and standards for environmental administration

(1) Statutes:
"Environment Protection Law of the People’s Republic of China" (中华人民共和国环境保护法)
"Atmosphere Pollution Prevention and Control Law Of the People’s Republic of China"
"Water Pollution Prevention and Control Law of the People’s Republic of China"
"Land Administration Law of the People’s Republic of China"
"Environmental Noise Pollution Prevention and Control Regulations of the People’s Republic of China"
"Measures Concerning with the Environmental Protection and Management of Capital Construction Project" issued by National Environmental Protection Agency
and the State Planning Commission

"Water Law of the People’s Republic of China”
"Water and Soil Conservation Law of the People’s Republic of China”
"River Course Management Regulations of the People’s Republic of China”
"Specifications Concerning with Environmental Protection Design for Construction Project”
"Rules Concerning with Pollution Prevention and Control for Drinking Water Protection Area”
"Regulations Concerning with Chemical Dangerous Goods Safety Management”
"Interim Measures Concerning with Environmental Pollution and Damage Accident Report”
"Measures Concerning with the Environmental Protection and Management for Communications Construction Project” issued by the Ministry of Communications
"Hubei Provincial Construction Project Environmental Impact Management Measures”
"Hubei Provincial Construction Project Environmental Protection Facility Completion and Acceptance Administration Measures”

(2) Standards
“Surface Water Quality Standard”
“Air Quality Standard”
“Urban Area Ambient Noise Standard”
“Industrial Enterprise Noise Standard”
“Construction Site Border Area Noise Level”
“Resident Ambient Air Lead and Its Inorganic Compound Content Standard”
“Bitumen Industry Pollutant Emission Standard”
“Light Vehicle Pollutant Emission Standard”
“Pollutant Emission Standard for Gasoline Engine at Idle Speed”
“Smoke Emission Standard for Diesel Engine at Free Acceleration Mode”

1.3 Organizations and responsibilities for environmental administration

The organizations for implementation of the environmental protection for this project can be classified as follows:

Administration and supervision agency

(1) Administration agency

The Environmental Protection Division (EPD) of the Hubei Provincial Communications Department (HPCD) is in charge of the overall project management, responsible for organization of the feasibility study of the project; formulation of environmental protection work plan for the project, to coordinate the environmental management activity of different authorities and the construction unit; providing advice to the construction unit to implement various management measures. The work division for the Environmental Protection Office (EPO) of the World Bank Loan project Office (WBLPO) of the HPCD is responsible for the design of environmental
protection plan and the implementation and management during the construction period; the Environmental Protection Branch (EPB) of the Hubei Provincial High-grade Highway Management Bureau (HPHHMB) is responsible for the implementation and management of the environmental protection plan during the road operation period.

(2) Supervision agency

Supervision work in different stages

a. During the feasibility study stage: National Environmental Protection Agency, Environmental Protection Office (EPO) of the Ministry of Communications (MOC), Hubei Provincial Environmental Protection Bureau (HPEPB), the World Bank and the Hubei Provincial Communications Department.

NEPA: is the competent authority at the central government for administration of national environmental protection; including overall in charge of project environmental protection management, examining and approval of terms of reference of EIA, examining and approval of EIA report, directing the provincial environmental protection bureaus to implement various laws and regulations.

EPO of the MOC: is in charge of environmental protection within the jurisdiction of the MOC, to prepare terms of reference of EIA, preliminary examining the EIA report.

HPEPB: is in charge of project environmental protection supervision administration; organizing and coordinating project environmental protection service provided by different departments; examining EIA report, or entrusted by the NEPA examining and approval of terms of reference of EIA and EIA report; supervision of implementation of environmental protection action plan; completion acceptance of project environmental protection facilities; identifying applicable laws, regulations and standards for project environmental protection; directing environmental protection departments or divisions at municipal or county level for project environmental protection management during project construction and operation periods.

b. Design and construction stage: EPD of the HPCD, HPEPB and its subordinate local area environmental protection bureau (EPB) in charge of the environmental protection management.

Municipal and county level EPB: to work under the guidance of the HPEPB, supervise the contractor to implement the environmental protection action plan, implementation of environmental management laws, regulations and standards; coordinate the environmental protection work of different departments; check and supervision of project environmental protection facility construction, completion acceptance, operation, within their jurisdiction areas.

c. Operation period: HPHHMB, HPEPB and its subordinates will be in charge.
d. The environmental monitoring during the construction and operation periods will be implemented by the WBPO, EPO of the HPHHMB, HPEPB and its subordinates respectively.

The environmental protection management procedures for the national road project III in Hubei province is shown in Fig. 1-3-1.

1.4 Components of the environmental protection action plan

- Environmental management plan: is the management activity to prevent or reduce negative environmental impact.
- Environmental supervision plan: is the supervision activity to ensure all the mitigation measures to be implemented simultaneously with the project.
- Environmental monitoring plan: is the environmental monitoring activity during the construction and operation period to eliminate the pollution.
2. Environmental Protection Management Program

2.1 Environmental protection program in the project feasibility study stage

The main environmental protection work in this stage is the EIA work for the construction project.

Entrusted by Hubei Provincial Communications Planning and Design Institute, the Environmental Engineering Design and Research Division of the Research Institute of Highway (RIOH) of the Ministry of Communications undertook the environmental assessment study for this project. In March, 1994, the RIOH completed the “Terms of Reference of the EIA for the Motorway Engineering of Hubei section of Beijing-Zhuhai national trunk road”, which was approved by the NEPA on 7th October, 1994. Therefore the “EIA Report on the Project of Northern Section of Beijing-Zhuhai National Trunk Road in Hubei Province” was completed in October 1995. Preliminary examination of the “EIA Report on the National Road Project III in Hubei Province” was accomplished on 4th March 1996 by the MOC.

2.2 Environmental protection program in the project engineering design stage

To carry out the environmental protection measures set forth in the EIA report, to prevent and mitigate the potential negative environmental impact arising from the project, this environmental protection action plan is specially prepared.

The main purpose of the environmental protection management during the engineering design period is as follows.

2.2.1 Road design

Road alignment should be selected taking into consideration of the overall natural and socio-economic environment of the areas along the proposed road, so as to prevent or mitigate the pollution and damage to the ecological environment caused by the road project. Therefore the following principles should be observed in the road design:

(1) Road design should be harmonized with landform, with reasonable land use and less farmland occupation as much as possible.

(2) Road should be away from the drinking water sources.

(3) Road should be away from cultural and historical relics and the scenic spots.

(4) Road should be away from city, town and densely populated areas as far as possible.

(5) Great importance should be attached to geological survey, to provide reliable basis for engineering design, particularly for the soft soil ground base treatment, so as to prevent the negative environmental impact caused by the unexpected road distress from being occurred later on.
(6) Pay attention to the selection of earth borrowing site and spoil area, by taking into account of water and soil conservation and other environmental impact.

(7) Careful design of the underpasses, so as to reduce the partition impact caused by the road and to provide convenience for the local people.

(8) To stabilize the subgrade, mortar slab combined with grass or totally covered grass slope should be used to protect the filled side slope. For the cut side slope, shotcrete, mortar slab, etc. surfacing technology can be used for protection. Subgrade protection can be done together with the engineering work and implemented by time schedule.

(9) Transition slab should be provided between the approach road and the bridge to make joint smooth so as to reduce vibration and noise caused by the joint.

(10) Protection forest belt should be planted along the air quality sensitive areas.

2.2.2 Attach great importance to drainage system

(1) Complete and perfect drainage system should be provided in road design. The pavement run-off and the surrounding surface run-off should be discharged to specifically designed area, other than the drinking water sources or fish ponds.

(2) The run-off from the bridge deck should be collected by pipes and discharged to the road side ditches, other than the river.

(3) If there is any damage to the original drainage system due to the new road construction, proper treatment or rehabilitation should be made to prevent any negative impact.

(4) Attach great importance to the drainage system design and the sewage treatment for the 4 service areas and the 3 road maintenance buildings, to make the sewage discharged to the local sewage system as far as possible, otherwise it should be considered to set up an independent sewage treatment and purification system before discharging.

(5) To prevent water pollution caused by the pollutants spillage from road accident in some sensitive areas, it is necessary to build anti-collision structures, special design for the drainage system, or sewage filter, so that once accident happens the pollutant can be cutoff to prevent the water sources from being polluted.

2.2.3 Impact of the bridge and culvert design on hydrology

The opening, clearance, as well as the filling height of the bridge head should be designed based on hydrologic calculation, flood control and navigation condition requirement.
For the bridges and culverts in connection with farmland irrigation system, flood discharge should be considered in the design to prevent the farm land from being damaged.

The designed flood discharge capacity for the bridges and culverts along the route of this road project is higher than the local flood control standard, without any negative impact on the hydrologic conditions.

2.2.4 Road management control areas along both sides of the road

According to the provisions set by the Hubei provincial people’s government, three road management control areas will be set up by both sides of the road. Within the road management control areas it is not allowed for any buildings to be built, if buildings such as power supply, water supply, gas supply and telecommunication facilities are to be built in the area, it should be applied and got to be approved before hand. The set up of the road management control area has good effect in environmental protection.

2.2.5 The environmental management target of the engineering design

The above mentioned measures have been included in the engineering design. A total of 340 underpasses, 16 pedestrian overpasses and aqueducts have been designed with all their locations being decided based on local area public inquiry and approval of the local government.

The location and layout of the building materials worksite for the engineering work are shown in Fig. 2-2-1.

Earth materials used for subgrade and pavement: There are enough earth materials for subgrade and pavement use for all the road sections except for that at the East-West lake area. The road passes through the hilly area with terrain fluctuations, which requires balanced cutting and filling work. The earth materials in the hilly areas are sandy or clayey with good physical performance to meet with road engineering requirement. In the light hilly and plain area, however, the earth quality is poor for engineering work with high level of water content due to the rich underground water resource and high level of the water table. So special treatment will be necessary for the local earth materials, or the earth from the nearby areas will have to be transported for the road section.

Sand: The area is rich in sand resource mainly distributed alongside the Huanshui river, Shawo river and Sheshui river, with good quality and many varieties. It is easy to get with good transport conditions.

Stones: Stone materials are distributed in the area along both sides of the road, with the main quarry site including Sigudun, Fangfanzhen and Xiaohezhen in Dawu
<table>
<thead>
<tr>
<th>Location</th>
<th>K50 - 000</th>
<th>K51 - 980</th>
<th>K59</th>
<th>K60 - 711</th>
<th>K66 - 950</th>
<th>K72 - 600</th>
<th>K75 - 150</th>
<th>K81 + 350</th>
<th>K88 + 500</th>
<th>Yard No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>707</td>
<td>0.12</td>
<td>6.12</td>
<td></td>
<td>6.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>II</td>
</tr>
<tr>
<td>Sand</td>
<td>6.01</td>
<td>0.11</td>
<td>10.85</td>
<td>18.05</td>
<td>18.05</td>
<td>18.05</td>
<td>18.05</td>
<td>18.05</td>
<td>18.05</td>
<td>III</td>
</tr>
<tr>
<td>Sand-Gavel</td>
<td>4.31</td>
<td>10.85</td>
<td>28.80</td>
<td>35.31</td>
<td>35.31</td>
<td>35.31</td>
<td>35.31</td>
<td>35.31</td>
<td>35.31</td>
<td>IV</td>
</tr>
<tr>
<td>Lime-slab stone</td>
<td>9.1</td>
<td>12.3</td>
<td>13.12</td>
<td>18.30</td>
<td>21.08</td>
<td>28.80</td>
<td>35.31</td>
<td>35.31</td>
<td>35.31</td>
<td>V</td>
</tr>
<tr>
<td>Various stones</td>
<td>5.81</td>
<td>4.70</td>
<td>6.01</td>
<td>8.80</td>
<td>8.80</td>
<td>8.80</td>
<td>8.80</td>
<td>8.80</td>
<td>8.80</td>
<td>VI</td>
</tr>
<tr>
<td>Various stones</td>
<td>0.21</td>
<td>12.13</td>
<td>20.18</td>
<td>20.18</td>
<td>20.18</td>
<td>20.18</td>
<td>20.18</td>
<td>20.18</td>
<td>20.18</td>
<td>VII</td>
</tr>
</tbody>
</table>

Legend:
- Crushed stone
- Sand
- Pavement
- Stone
- Lime
- Gravel
- Stone ballast
- Soil
- Bridge
- Large interchange

Note:
1. Average haul distance is calculated assuming that the materials are evenly distributed.
2. Mixed stone includes slab, block, crushed stone, gravel, stone chip, stone ballast, and their mixtures.
3. The materials yard is for both subgrade and pavement.
4. This figure is the materials supply for Xiongchong district.

Fig. 2-2-1 Haul distance for road construction materials (2)
### Table

<table>
<thead>
<tr>
<th>Location</th>
<th>K90 - 150</th>
<th>K97 - 950</th>
<th>K100 - 250</th>
<th>K103 - 900</th>
<th>K106 - 300</th>
<th>K110 - 000</th>
<th>K116 - 060</th>
<th>K120 - 006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>34</td>
<td>31.2</td>
<td>4.180</td>
<td>4.1</td>
<td>51.4</td>
<td>56.53</td>
<td>602</td>
<td>911</td>
</tr>
<tr>
<td>Gravel</td>
<td>44.8</td>
<td>48.65</td>
<td>4.180</td>
<td>4.1</td>
<td>51.4</td>
<td>56.53</td>
<td>602</td>
<td>911</td>
</tr>
<tr>
<td>Sand</td>
<td>47.2</td>
<td>51.4</td>
<td>56.53</td>
<td>602</td>
<td>911</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Various stones</td>
<td>31.2</td>
<td>28.4</td>
<td>35.60</td>
<td>4.180</td>
<td>4.1</td>
<td>51.4</td>
<td>56.53</td>
<td>602</td>
</tr>
<tr>
<td>Various stones</td>
<td>35.60</td>
<td>31.5</td>
<td>35.91</td>
<td>4.180</td>
<td>4.1</td>
<td>51.4</td>
<td>56.53</td>
<td>602</td>
</tr>
<tr>
<td>Lime</td>
<td>88.75</td>
<td>85.95</td>
<td>78.65</td>
<td>75</td>
<td>79</td>
<td>87.53</td>
<td>911</td>
<td>911</td>
</tr>
</tbody>
</table>

### Legend

- Crushed stone
- Sand
- Pavement
- Stone
- Various stone
- Lime
- Block slab stone
- Soil
- Gravel
- Stone ballast
- Large interchange
- Bridge

### Note

1. Average haul distance is calculated assuming that the materials are evenly distributed.

\[
\bar{d} = \frac{\sqrt{d1^2 + d2^2 + d3^2}}{3}
\]

2. Mixed stone includes slab, block, crushed stone, gravel, stone chip, stone ballast, and their mixtures.

3. The materials yard is for both subgrade and pavement.

4. This figure is the material supply for Xiaoman district.

**Fig. 2-2-1 Haul distance for road construction materials (3)**
### Table 1: Haul Distance for Road Construction Materials

<table>
<thead>
<tr>
<th>Location</th>
<th>K120.006</th>
<th>K124.2025</th>
<th>K130.000</th>
<th>K137.800</th>
<th>K138.156</th>
<th>K141.500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various stones</td>
<td>61.46</td>
<td>57.25</td>
<td>51.65</td>
<td>47.65</td>
<td>46.70</td>
<td>49.95</td>
</tr>
<tr>
<td>Lime</td>
<td>75.44</td>
<td>71.25</td>
<td>65.45</td>
<td>81.65</td>
<td>58.70</td>
<td>62.05</td>
</tr>
<tr>
<td>Stone ballast</td>
<td>51.44</td>
<td>47.25</td>
<td>41.45</td>
<td>37.65</td>
<td>34.70</td>
<td>38.05</td>
</tr>
</tbody>
</table>

### Fig. 2-2-1: Haul Distance for Road Construction Materials (4)

**Legend:**
- **□□□** crushed stone
- **□□□** sand
- **□□□** pavement
- **□□□** slab block stone
- **□□□** lime
- **□□□** gravel
- **□□□** Stone ballast
- **□□□** large interchange
- **□□□** earth
- **□□□** bridge

**Note:**
1. Average haul distance is calculated assuming that the materials are evenly distributed.
2. **Equation for calculation**
   \[ x = \frac{\sum L \cdot V}{225 \text{ km}^3} \]
3. All materials, except for earth, will be transported from other areas via K137+450.
4. This figure is the materials supply for East-West Lake area.
<table>
<thead>
<tr>
<th>Materials</th>
<th>KM² - Volume</th>
<th>KM²</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed stone</td>
<td>22,890</td>
<td>3,470</td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td>22,890</td>
<td>3,470</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>22,890</td>
<td>3,470</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>22,890</td>
<td>3,470</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2-2-1 Haul distance for road construction materials (5)
### Materials Location and Supply

<table>
<thead>
<tr>
<th>Materials</th>
<th>KM³</th>
<th>km</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed stone</td>
<td>114.91</td>
<td>14.517</td>
<td>7.68</td>
</tr>
<tr>
<td>Slab block stone</td>
<td>114.91</td>
<td>14.517</td>
<td>7.68</td>
</tr>
<tr>
<td>Stone chippings</td>
<td>114.91</td>
<td>14.517</td>
<td>7.68</td>
</tr>
<tr>
<td>Sand</td>
<td>237.318</td>
<td>14.517</td>
<td>16.35</td>
</tr>
<tr>
<td>Lime</td>
<td>267.326</td>
<td>14.517</td>
<td>18.41</td>
</tr>
<tr>
<td>Earth</td>
<td>18.563</td>
<td>14.517</td>
<td>1.28</td>
</tr>
</tbody>
</table>

**Note:**
1. Average haul distance is calculated assuming that the materials are evenly distributed.
2. Equation for calculation
   \[
   S = \frac{\sum L \cdot Y \cdot \left( X_1^2 + X_2^2 + 2 \right)}{\sum L}
   \]
   where: S - average haul distance

---

**Materials yard for West Section of Wuhan of Shanghai-Chengdu route (Zhushan-Yongan)**
Materials yard for East Section of Wuhan of Shanghai-Chengdu route (Shenshan-Baoxie)

<table>
<thead>
<tr>
<th>materials &amp; CHD</th>
<th>sand</th>
<th>stone</th>
<th>lime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.67</td>
<td>6.92</td>
<td>9.27</td>
</tr>
</tbody>
</table>

Note:
1. The haul distance for the large interchange is calculated respectively.
2. The haul distances for materials for the pavement, mid and small bridge and general facilities are calculated based on even distribution with formula:

\[ S = \frac{(y + x_1/2)x_1 + (y + x_2/2)x_2}{l} \]

where:
- \( S \) - comprehensive haul distance (CHD)
- \( y \) - the distance from the materials yard to the work site
- \( x_1 \) and \( x_2 \) - lengths of the paved segment
- \( l \) - the length of the segment

3. The figure above the straight line is the shortest distance from the materials yard to the work site.
county; Tugang and Fengshanzhen in Xiaochang county; Caidian, Hengshan, Zhashanzhen and Zhuruzhen in Caidian region; Yunjingshan, Gezishan and Fenghuangshan in Jiangxia region; etc.. The stone materials in all these areas are of good quality with great amount of storage and varieties as well as good transport conditions.

Lime: lime materials are distributed in the areas of Sigudun and Fangfanzhen in Dawu county; Zhashan and Zhuruzhen in Caidian region; Yunjingshan and Gezishan in Jiangxia region; etc.. The lime materials in all these areas are of good quality to meet the engineering requirements with good transport conditions.

Cement: There are cement plants along the proposed road area, which can meet part of the demands for 425# cement with short transport distance. The shortfalls of the 425# cement and the above will have to be bought from Wuhan and transported by road.

Great amount of materials will be needed for the road project, therefore it is more economical to use the local materials as much as possible. Road is the main mode for the transport and temporary road may be built when it is necessary.

2.3 Environmental protection program in the project construction stage
In construction period, environmental protection is one of the responsibilities for the Contractor. According to the provisions set forth by the FIDIC in the civil engineering assessment contract condition, during the course of engineering construction, completion and repairing of other faults, the Contractor should take all the reasonable steps possible to protect the environment of the worksite and the vicinity areas, to avoid any pollutant, noise or other injuries or damages to human bodies or properties caused by engineering work.

Therefore the following requirements are brought forward in the bidding document with reference to the EIA report for the project and the engineering design,

2.3.1 Control of flying dust
(1) The Contractor should take all the reasonable measures possible, including necessary watering deemed to be necessary by the Engineer, to reduce the dust caused by construction work to the minimum.

(2) The bulk materials should be covered when they are transported.

(3) Proper coverage or watering should be provided for bulk materials storage site.

(4) Dust control devices should be used for road side cement and bitumen mixing plant and stone crusher.
(5) If the Contractor has not done his best to prevent the dust from flying or has caused pollution to the nearby water pond, farmland or the environment, the Contractor should bear full responsibility for any damage and the results thereof.

(6) To improve the air environment, a 100 m long 20 m wide green belt should be planted alongside the Jinkou Medical Plant and Baoxie road sections respectively during the construction period, where concentration of NOx will be over the standard level limit in the mid and long term operation period.

2.3.2 Water management

(1) Any structures such as bank, diverting ditch, aqueduct, pipes, drainage pipes and all other protection structures, necessary to be built for protection of the road structures from being damaged by the underground water, should be designed, constructed and maintained by the Contractor.

(2) All the water pumped out from underground should be discharged in such a way that it will not cause any damage, loss or pollution to the land owner and other contractors of the project owner, and the individuals on-the-spot or the vicinity areas.

(3) The Contractor should take all necessary measures to prevent the water containing any pollutant or visible suspension substances from being discharged into the river, waterway or the existing irrigation system and drainage system.

(4) The Contractor should not do anything to cause change of natural flow pattern of the river, waterway or the existing irrigation system, no matter what purpose it would be, unless he gets the written approval from the Engineer beforehand.

(5) During the process of the drainage engineering (culverts etc.) construction, the Contractor should not interrupt the existing irrigation and drainage system of the land owner and should provide temporary irrigation and drainage conduits or pipes.

(6) The waste silt generated by drilling should be disposed at a designated site by barge, and should not be discharged directly into the river.

(7) Although the accident probability is small, first aid action plan should be made to cope with the emergencies (such as oil pollution of water area). To reduce the damage and loss to the minimum, emergency program should be worked out based on the features of each bridge engineering, to protect the water resources of the Hanjiang river, Huanshui river, Shawo river, Lunhe river, Fuhe river, Tongshunhe river, and the aquatic life.

a. A first aid team should be organized including people from fire-fighting, environmental protection, and public security departments under the leadership of the
provincial communications department, which is an organizational guarantee.

b. An emergency action plan should be made with clear work and responsibility division as well as logic procedures, necessary equipment, and material and man power supply system.

c. Personnel training for the first aid team members so as to be capable of being quick in response and efficient.

d. To prepare necessary materials and equipment to clear away the oil spillage caused by accident.

e. Once the oil pollution accident happens, it should be reported immediately, and the emergency first aid team should be in action to clear away the oil pollutant. It is necessary to give award to those who timely report the accident and to punish those who hide the accident and shirk responsibility.

f. Detailed accident record should be made on-the-spot, including time, location, cause, conditions, scope, quantity and other environmental data.

2.3.3 Control of soil erosion

(1) The Contractor should take all the measures possible to prevent soil erosion in the areas being used or occupied by him and the bed or bank of river, waterway, irrigation system or drainage system.

(2) The Contractor should take all the measures possible to prevent the materials from being disposed to any river, waterway, irrigation system or drainage system.

2.3.4 Prevention and control of pollutant from bitumen mixing plant

(1) The pavement bitumen mixtures should be prepared in stationary mixing plant. The mixing plant should be equipped with dust collection device to prevent air pollution.

(2) The mixing plant should be established in the place at least 500 m from the densely populated areas. The Contractor should consult with the local environmental protection department for the location of the mixing plant.

2.3.5 Protection of the existing public utility facilities

(1) Proper measures should be taken by the Contractor to protect the public utility facilities, which is being affected or will be affected by this project.

(2) Where cutting work is conducted near any public utility facility, the Contractor should inform the owner of the facility before hand of the event in written form, and invite the representative to supervise the work on-the-spot. One copy of the
written notification and invitation should be handed over to the Engineer.

2.3.6 To mitigate the construction noise impact

(1) Where there are resident areas within 200 m from the worksite, the Contractor should arrange work time in the daytime as much as possible, i.e. from 6:00 am to 22:00 pm; and no work should be arranged at nighttime (from 22:00 pm to 6:00 am). In case that some work have to be done at nighttime, a written application should be submitted by the Contractor to the local government and the environmental protection department for approval, as well as the local residents' approval. Meanwhile the workers' working shift should be arranged in such a way that they can have enough time to get recovered from being disturbed by the noise environment by different working shift.

(2) The Contractor should strengthen proper maintenance of the construction machines, including installation of silencer to keep the noise at the minimum level.

2.3.7 Water and soil conservation and ecological balance

(1) Treatment of cut section surface water and underground water: surface water at cut section should be discharged through the drainage system. Interception ditch should be arranged properly to discharge the underground water to protect the cut slope or the embankment from being eroded by the water. The interception ditch should be constructed together with the subgrade. If there is any spring encountered, timely treatment should be done by trench drainage or underdrain.

(2) The spoils should be disposed properly without any damage to the nearby plants, farmland and other engineering structure. The spoils along the river side should not block the waterway or change the natural flow pattern of the river.

The spoil area should be planted or leveled and used as cultivated land when it is possible.

(3) The borrow pit should be at high land or waste land as much as possible. If farmland will have to be selected as borrow pit site, it is necessary to preserve the surface soil before borrowing and put the preserved surface soil back after borrowing. For large area and deep borrow pit, water storage tank or fish pond may be built when it is necessary.

(4) Where sand and gravel materials are taken from river bed, it is necessary to pay attention to the natural flow pattern of the river and to observe the provisions specified in the Water Law of the People’s Republic of China.

Note: Under the section 24 of the Water Law of the People’s Republic of China: Exploitation of sand, gravel, gold contained sand within the flood discharge and navigation channel area shall be approved by the competent authority of the waterway, with specified exploitation scope and method. Where navigation channel is involved,
it shall be approved by the competent authority of the waterway together with the competent authority of the navigation channel.

The location of the quarry should be selected taking into account of the environment protection, including noise (explosion, stone crushing, etc.), vibration caused by explosion, safety, transport conditions and time, and should be approved by the local government and local environmental protection department before hand, through necessary procedures.

Safety measures should be taken by the Contractor during explosion, with proper warning signal and cordon line system being arranged, to protect people, livestock, vehicle from being injured or damaged.

The storage and use of the explosion materials should be in accordance with the regulations set forth by the public security department.

(5) Personnel training should be provided for the employees for them to understand the importance of environmental protection policy to protect natural resources and the wild life and plants, which should also be included in the employment contract.

(6) Proper lighting should be provided for night work for safety purpose. Traffic signs and road marks should also be provided with necessary traffic rules.

2.3.8 Cultural relics protection

As for discovery of cultural and historical relics, such as fossil, coins, or other valuable cultural relics, during the course of road construction, the Contractor should observe the provisions under the section 27.1 of the FIDIC civil engineering construction contract condition.

Note: Section 27.1 of the civil engineering construction contract condition.

All the fossil, coins, valuable articles, or cultural relics, building structures and other relics or articles of geological or archaeological value, as far as the Owner and the Contractor are concerned, shall be deemed as the property of the Owner absolutely. The Contractor should take reasonable measures to prevent his employee or other person from moving or damaging the articles. Once the above mentioned articles are discovered, it should be informed to the Engineer of the event immediately, which should be disposed according to the direction given by the Engineer. Any delay and/or cost increase thereof for the Contractor may be compensated by the following decisions, after the consultation between the Owner and the Engineer.

a. Under section 44, the Contractor may have power to postpone the construction period;
   b. The said cost shall be added to the contracted price.
The decision should be notified to the Contractor and a copy submitted to the Owner.

2.3.9 Provisional labour camping area environmental management

The environmental management for the provisional living area, office and labour camping area should be the responsibility of the Contractor.

(1) The drinking water should be in conformity with the requirement set forth by the World Health Organization;

(2) The septic tank and sewage treatment system should be properly designed and cleaned regularly.

(3) Daily life solid wastes should be disposed at fixed place with regularly disposed garbage tank.

(4) Necessary medical and first aid service should be provided during construction period.

(5) Proper fire-fighting equipment should be available.

2.3.10 Road traffic management during construction period

(1) The location and layout of the road construction material yard (sand and stone materials, earth borrowing site, bitumen mixing site) and the road used for transport of the materials from the yard to the construction site have been illustrated in figures. During the road construction period, the Owner will entrust the local traffic management department and public security department to strengthen the traffic management for these roads. The cost of the traffic management will be born by the Owner.

(2) The design, construction and maintenance and traffic management for the detour road used during construction period will be the responsibility of the Contractor. The detour road includes all the roads connected with the worksite and from the worksite to the construction materials yard and the wastes disposal site, as well as roads within the worksite. If the existing earth road is used as temporary detour road or for construction use, the Contractor should be responsible for its maintenance and traffic management. The road maintenance and traffic management costs of the detour road and existing earth road will be deemed to have been included in the permanent road project, unless it is appeared independently in the engineering list.

2.4 Environmental protection program in the project operation stage

2.4.1 Road traffic accident prevention and control

Road and traffic signs and markings, traffic monitoring and control system,
emergency telephone system have been included in the road engineering design, in accordance with the road traffic safety management regulations. During the road operation period, the Provincial High-grade Highway Management Bureau will strictly carry out the enforcement of the road traffic safety management regulations, including strengthening regular and random vehicle, inspections, and formulate road accident first aid program.

2.4.2 Emergency plan and first aid for dangerous goods spills caused by traffic accident

It imperative for dangerous goods carriers to strictly observe the regulations concerned with dangerous goods transport. Meanwhile emergency plan and first aid for dangerous goods spills caused by traffic accident will be formulated and organized to cope with the emergencies.

(1) Organization: a first aid leading group should be established, with the people from HPHHMB and HPEPB as the group leader and deputy leader respectively, and with the first aid team members from the EPO of the HPHHMB, traffic management division of the Public Security Bureau, fire-fighting fleet, and experts from chemical and public health departments.

The responsibility of the leading group: to organize the first aid activity whenever accident happens, including dispatch people, vehicles, equipment, medical etc..

The EPO of the HPHHMB will be responsible for the routine work of the leading group office, including accident disposition, environmental monitoring and first aid preparations.

(2) Emergency disposition and first aid: whenever accident happens, the EPO of the HPHHMB will inform the leading group by emergency telephone immediately of the accident, including, time, location, environment pollution and damage pattern, pollutant source major pollutant and personal injuries and damage, etc..

Once the leading group gets the information they will go to the accident spot immediately to take necessary measures, to stop the pollutant from being further dispersed, e.g. if the pollution involves water body, the water supply system should be cut off immediately; and medical services should be provided for personal injuries by the first aid team.

(3) Medical: first aid medical used for emergencies caused by chemical dangerous goods related accident should be prepared.

(4) Monitoring equipment: the monitoring equipment should be provided by the local environmental protection agency.
(5) Pollution accident report and statistics system: pollution accident report, record and statistics system should be established.

2.4.3 Contingent pollution accident monitoring

Although the probability of contingent pollution accident is small, the resulted pollution may be serious, in case of which the accident monitoring is also necessary to provide useful information basis for analysis and future prevention work.

2.4.4 Traffic management

(1) In-use vehicles of low speed with high level noise, high level fuel consumption, should be banned from running on the proposed motorway.

(2) According to the provisions of the “Environmental Noise Pollution Prevention and Control Regulations of the People’s Republic of China”, the motor vehicles running on road should be equipped with muffler and horn of low noise level and in good technical conditions. And no license should be given to vehicles with noise level higher than the standard limit.

The standard noise level limit or allowable noise level (GB1495-79) for the motor vehicles is shown in table 2-4-1.

(3) the emission from the motor vehicles running on the motorway should be up to the state standard.

(4) The lowest speed and the highest speed on the motorway are recommended at 60 km/h and 120 km/h respectively.

| Table 2-4-1 The standard of allowed noise level for motor vehicles (GB1495-79) |
|-----------------------------------|----------------------------------|
| Vehicle category                  | db (A)                           |
| Truck                             |                                  |
| 8 tons < gross weight < 15 tons   | 89                               |
| 3.5 tons < gross weight < 8 tons  | 86                               |
| gross weight < 3.5 tons           | 84                               |
| Light field vehicle               | 84                               |
| Bus                               |                                  |
| 4 tons < gross weight < 11 tons   | 86                               |
| gross weight < 4 tons             | 83                               |
| Passenger car                     | 82                               |
| Motorcycle                        | 84                               |
| Wheel type farm use tractor (< 60 hp) | 86                           |

2.4.5 Strengthen road traffic management and road maintenance management

(1) It is recommended that the driving speed within the road section near villages and towns should be limited at 60 km/h at night, to reduce noise (6 dB reduction can be expected).

(2) To strengthen road maintenance work to keep road in good condition.
2.5 Investment estimation for the environmental protection facilities

The investment estimation for the environmental protection facilities is shown in Table 2-5-1.

<table>
<thead>
<tr>
<th>Item</th>
<th>Content or calculation method</th>
<th>Investment CNY million</th>
<th>Environmental effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA &amp; design</td>
<td>Monitor, report, design</td>
<td>0.80</td>
<td>Current condition survey, forecast, control, optimization, measure implementation</td>
</tr>
<tr>
<td>Planting</td>
<td>Plant turf &amp; trees, median strip, CNY50000/km × 20.408km, CNY20000/km × 32.8km</td>
<td>10.024</td>
<td>Mitigation for air, noise, ecology, resident health, and landscape beautification</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>Higher wall, install noise-proof doors &amp; windows, plant green belt CNY 1000/m × 650 m</td>
<td>1.4</td>
<td>To reduce noise pollution, protect the residents’ and students’ health</td>
</tr>
<tr>
<td>Noise barrier</td>
<td></td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Measure to prevent pollution</td>
<td>To install air conditioner at toll station, etc.</td>
<td>0.60</td>
<td>To protect the employees’ health</td>
</tr>
<tr>
<td>Beautification</td>
<td>Beautification of toll station, dormitory, interchange, buildings and road signs</td>
<td>0.7</td>
<td>To beautify the environment for travel, work &amp; living area, to improve efficiency &amp; reduce accident</td>
</tr>
<tr>
<td>Environmental training</td>
<td>Personnel training for road construction and management</td>
<td>0.5014</td>
<td>To improve the professional skill for environment protection</td>
</tr>
<tr>
<td>Sewage water treatment for service area</td>
<td>Daily life sewage and vehicle washing waste water treatment for the 4 service areas</td>
<td>2.4</td>
<td>Prevent the water body from being polluted by sewage and waste water, and to protect ecological environment</td>
</tr>
<tr>
<td>Cultural &amp; historical relics protection</td>
<td>Investigation of cultural and historical relics (not including the unforeseen cost)</td>
<td>0.27</td>
<td>Protect cultural and historical relics</td>
</tr>
<tr>
<td>Emergency aid for accident</td>
<td></td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>Include monitor equipment</td>
<td>2.1708</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20.3186</td>
<td></td>
</tr>
</tbody>
</table>

2.6 Environmental protection personnel training

Due to China is lack of the experiences in road project environmental protection management, it is proposed that a personnel training program be jointly made by the World Bank Project Office and the Hubei Provincial Communications Department, and 5 persons be sent to industrialized country for advanced study or training, so as to understand and grasp advanced management technique and experiences. Training for the other newly recruited persons will be held in China by domestic experts. The budget for training is about CNY 0.25 million.

3. Environmental Protection Supervision Program

The environmental protection supervision plan is shown in Table 3-1-1.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Agency</th>
<th>Work content</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility</td>
<td>NEPA</td>
<td>1. Examine the TOR of EIA</td>
<td>1. To ensure the EIA content fully covered proper topic arrangement, with key points highlighted</td>
</tr>
<tr>
<td>study</td>
<td>HPEPB</td>
<td>2. Examine the EIA</td>
<td>2. To ensure the possible serious issues for the project to be addressed properly</td>
</tr>
<tr>
<td></td>
<td>HPCD</td>
<td>3. Examine the draft of EAP</td>
<td>3. To ensure there is feasible action plan</td>
</tr>
<tr>
<td>Design &amp;</td>
<td>NEPA</td>
<td>1. Examine preliminary design for environment protection &amp; EAP</td>
<td>1. To carry out the “three simultaneousness” &amp; EAP</td>
</tr>
<tr>
<td>construction</td>
<td>HPEPB, Local, municipal</td>
<td>2. To examine if there is investment for environment protection</td>
<td>2. To make sure the investment being made</td>
</tr>
<tr>
<td>period</td>
<td>&amp; county EPB</td>
<td>3. To check construction site: material handling, mixing etc.</td>
<td>3. To make sure the work site to meet the requirements of environment protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. To check dust &amp; noise control measures &amp; work time schedule</td>
<td>4. To reduce the impact &amp; implement regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. To check poisonous &amp; harmful material storage &amp; emissions</td>
<td>5. To reduce the impact &amp; to implement the regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. To check waste water &amp; oil disposal &amp; treatment</td>
<td>6. To make sure the surface water not to be polluted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. To dispose filling &amp; cutting site</td>
<td>7. To make sure the landscape &amp; the land resources being preserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. To check the implementation of the “three simultaneousness” &amp; to determine the final time schedule</td>
<td>8. To make sure the implementation of the “three simultaneousness”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. To examine if the environment protection facilities in conformity with the standards</td>
<td>9. To check and accept the environment protection facilities</td>
</tr>
<tr>
<td></td>
<td>PCRB</td>
<td>10. Check if there is cultural relics underground</td>
<td>10. To protect cultural relics supervised by the Provincial Cultural Relics Bureau (PCRB)</td>
</tr>
<tr>
<td>Operation</td>
<td>HPHHMB, Local, municipal</td>
<td>1. To examine EAP implementation</td>
<td>1. To carry out EAP</td>
</tr>
<tr>
<td>period</td>
<td>&amp; county EPB</td>
<td>2. To examine the implementation of environment monitor plan</td>
<td>2. To carry out environment monitor plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. To check if there is any further necessary measures to be adopted (possible issues unexpected before)</td>
<td>3. To protect the environment in every possible way</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. To check if the environmental quality in the sensitive areas is in conformity with the standards</td>
<td>4. To strengthen environmental management &amp; to protect people’s health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. To examine the waste water treatment in the service area</td>
<td>5. To make sure the waste water discharge in conformity with the standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. To examine if the surface water drainage in the right way</td>
<td>6. To make sure the drinking water source not to be polluted by the surface water drainage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. To strengthen management of accident prevention &amp; monitoring system, set up first aid action plan for emergencies, so as to remove the leakage of dangerous goods away in time once accident happens</td>
<td>7. To eliminate any hidden danger of accident &amp; to reduce lost as much as possible once accident happens</td>
</tr>
</tbody>
</table>

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4. Environmental Monitoring Program

4.1 Purpose
The environmental impact during the construction period mainly includes water pollution caused by the wastes and sewage, noises from the construction machines, water and soil erosion caused by earth and stone cutting and filling, flying dusts and bitumen smoke from the mixing plants, and other pollutants. In the operation period the emissions from the traffic vehicles will be the main source of pollution. In addition, contingent pollution accident may have serious impact on the environment. Therefore it is necessary to understand the environment conditions and development trend to improve environmental management service, through environmental monitoring program.

4.2 Organization
In the road construction and operation periods the Environmental Protection Office of the Provincial Communications Department, the Environmental Protection Office of the PHHMB and its subordinates will be responsible for the environmental monitoring work along the whole route.

4.3 Implementation of conventional environmental monitor work
Conventional monitor work will be carried out by qualified monitor unit under the HPCD, acording to the monitor plan, with the details shown in Table 4-3-1.

The main items measured in the monitor work are air quality, water quality, noise, by using on-the-spot fixed point and mobile measurement with fixed time and random sampling methods according to the monitoring requirements.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Location</th>
<th>Item</th>
<th>Frequency</th>
<th>Duration</th>
<th>Sampling</th>
<th>Action unit</th>
<th>Unit in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Bitumen Mixing Plant</td>
<td>TSP, bitumen</td>
<td>once per</td>
<td>3 days</td>
<td>construction time, 1 each</td>
<td>Monitor unit under</td>
<td>HPCD</td>
</tr>
<tr>
<td>period</td>
<td></td>
<td>smoke,</td>
<td>week</td>
<td></td>
<td>a.m. &amp; p.m.</td>
<td>HPCD</td>
<td>World Bank Project Office (WBPO)</td>
</tr>
<tr>
<td></td>
<td>Lime Mixing Plant, Unpaved</td>
<td>TSP</td>
<td>Random</td>
<td>1 day</td>
<td>Ditto</td>
<td>Ditto</td>
<td>HPCD</td>
</tr>
<tr>
<td></td>
<td>provisional road</td>
<td>Random sampling</td>
<td></td>
<td></td>
<td>Ditto</td>
<td>Ditto</td>
<td>WBPO</td>
</tr>
<tr>
<td>Operation</td>
<td>Primary schools of Liuwan,</td>
<td>NOx</td>
<td>2/year</td>
<td>5 days</td>
<td>7:00 - 10:00; 14:00-17:00</td>
<td>Ditto</td>
<td>HPHHMB</td>
</tr>
<tr>
<td>period beginning &amp; mid term</td>
<td>Xinfu, &amp; Liuhuan</td>
<td>CO</td>
<td>(1 each in Jan. &amp; July)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add: resident area</td>
<td>NOx</td>
<td>Ditto</td>
<td>5 days</td>
<td>Ditto</td>
<td>Ditto</td>
<td></td>
</tr>
<tr>
<td></td>
<td>near Jinkou Pharma. Factory &amp; Baoxie</td>
<td>TSP</td>
<td></td>
<td></td>
<td>Ditto</td>
<td>Ditto</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-3-1b Ambient Noise Monitor Plan

<table>
<thead>
<tr>
<th>Phase &amp; Location</th>
<th>Item</th>
<th>Frequency</th>
<th>Duration</th>
<th>Sampling</th>
<th>Action unit</th>
<th>Unit in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period:</td>
<td>Ambient noise</td>
<td>once per week</td>
<td>2 days</td>
<td>Construction time, twice/day</td>
<td>Monitor unit under HPCD</td>
<td>HPCD</td>
</tr>
<tr>
<td>Residential or sensitive area 150 m from work site,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>WBPO</td>
<td></td>
</tr>
<tr>
<td>Buildings 50 m from pile driving work site</td>
<td>Vibration</td>
<td>all work time</td>
<td>construction period</td>
<td></td>
<td>Contractor Ditto</td>
<td></td>
</tr>
<tr>
<td>Operation period: (before 2010) Xiaojialing, Hanyang San Zhong, Primary Schools of Wusicun, Wangjiafan, Quanli Liuhuan, Xingfu, Liuwan, &amp; villages less than 200m from road</td>
<td>Traffic noise</td>
<td>4/year</td>
<td>2 days</td>
<td>10:00 - 11:00; 22:00 - 23:00</td>
<td>Monitor unit under HPCD</td>
<td>HPHHMB</td>
</tr>
<tr>
<td>Operation period: (2010 - 2020) Add: Jianguo village, Dingjiatai, Xiaohe Guanshancun, Pengjiayuan, Zhangwan</td>
<td>Traffic noise</td>
<td>4/year</td>
<td>2 days</td>
<td>10:00 - 11:00; 22:00 - 23:00</td>
<td>Ditto Ditto</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-3-1c Water quality monitor plan

<table>
<thead>
<tr>
<th>Phase</th>
<th>Location</th>
<th>Item</th>
<th>Frequency</th>
<th>Duration</th>
<th>Sampling</th>
<th>Action unit</th>
<th>Unit in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period</td>
<td>Han river, Tongshun river bridge area,</td>
<td>CODcr</td>
<td>3 times per year (normal water level, one, a.m., one, p.m.)</td>
<td>one day</td>
<td>Monitor unit under HPCD</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>Operation period</td>
<td>Junshan Yangtze Oil</td>
<td>BOD₅</td>
<td>High level, (normal water level, one day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oil</td>
<td>Low level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.4 Cost estimation

The total monitoring cost for the main road is CNY 1970.8 thousand; and the total monitoring cost for the connection road is CNY 200 thousand.

4.4.1 Air

The monitoring cost for air quality is CNY 200000 during construction period, and CNY 1400000 during operation period, with a total of CNY 1600000.

4.4.2 Noise

The monitoring cost for noise is CNY 57600 during construction period, and CNY 193200 during operation period, with a total of CNY 250800.

4.4.3 Water

The water monitoring cost is CNY 120000 during construction and operation period.
To implement the monitor plan and ensure quality work, it is necessary to have personnel training, based on the monitor task, requirements and the equipment adopted. The monitoring work will be carried out according the contract signed between the Owner and the entrusted unit.

4.5 Personnel training

Due to lack of experience in motorway environmental monitoring and management, it is necessary to learn advanced experiences both at home and abroad, i.e. those experiences from similar motorway project in China and those from developed countries. The estimated total cost for training is about CNY 251400.

Contingent accident monitor cost (unforeseen cost) is about CNY 150000/year.

<table>
<thead>
<tr>
<th>Environmental issue</th>
<th>Actions have been/will be taken</th>
<th>Unit in charge</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alignment selection</td>
<td>One recommended scheme has been selected from 7 alternatives, with least land occupation, air and noise pollution impact on resident areas.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>2. Traffic interference</td>
<td>340 underpasses, 16 pedestrian overpasses &amp; aqueducts have been designed, to meet local people’s needs</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>3. Soil erosion</td>
<td>Plantations in the central division area, side slope, and all other areas suitable for plantation have been designed.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>4. Earth work</td>
<td>Flying dust and other environmental impact on sensitive areas have been considered in earth borrowing site selection.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>5. Water pollution</td>
<td>Work site waste water treatment facility have been designed and the sewage water will be discharged into the local sewage system.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>6. Noise</td>
<td>Smooth bridge joint has been designed to reduce the noise caused by uneven joint. 4 noise barriers with total length of 650 m and height of 3 m, have been designed for Liuhan Primary School, Xinfu Primary School and Hanyang No. 3 Second School. Other measures such as improvement of buildings and plantation will be done.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>7. Flood control</td>
<td>Once in a century flood has been taken into account in the flood discharge capacity design.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>8. Cultural relics</td>
<td>No cultural relics has been discovered yet.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>9. Afforest</td>
<td>Afforesting plan has been made to protect air environment and for beautification. 100 m long and 20 m wide green belt will be built along the road side at Jinkou Pharmaceutical Factory and Baoxie respectively.</td>
<td>HPCD</td>
<td></td>
</tr>
<tr>
<td>10. Dangerous goods spills</td>
<td>To prevent important water source from being polluted by dangerous goods spills, anti-collision wall has been designed for some sensitive areas. Pollutant will be discharged by drainage system to non-sensitive areas or sewage tank.</td>
<td>HPCD</td>
<td></td>
</tr>
</tbody>
</table>
### Summary of action plan for Hubei province national road project III (Construction period)

<table>
<thead>
<tr>
<th>Environmental issue</th>
<th>Actions have been/will be taken</th>
<th>Unit in charge</th>
<th>Note</th>
</tr>
</thead>
</table>
| 1. Dust / air pollution      | - All reasonable measures, including watering will be adopted, particularly near the densely populated areas.  
- Material storage area will be set far away from resident area.  
The bulk materials will be covered at storage site or while being transported or watered to prevent dust pollution.  
- Bitumen mixing plant will be set at leeward direction 500 m away from resident area.  
- Dust collector will be equipped for construction machine.                                                                                                                   | Contractor     |      |
| 2. Soil erosion/ water pollution | - Plantation on side slope and road side. If the existed irrigation or drainage systems have been damaged due to the road project, proper rehabilitation or reconstruction will be conducted.  
- To protect rivers, water trench, existing irrigation or drainage system from being blocked by soil and stone.  
- Some temporary trenches or pipes will be built together with the construction of permanent drainage system.  
- All reasonable measures to prevent sewage water being directly discharged into river and irrigation system.                                                                 | Contractor     |      |
| 3. Noise                     | - Construction with high noise level will not be arranged at night time (22:00 – 6:00). If it have to be done at night time, it should be approved by the local government in written form.  
- Strengthen maintenance of road construction machine and the machines should be equipped with muffler.                                                                                              | Contractor     |      |
| 4. Land resources protection | - No earth borrowing pit should dug in forest area.  
- Farmland should not be used for earth borrowing. If it have to be borrowed from farmland, the top surface soil should be put aside preserved and will be returned back to the farmland afterward.  
- Personnel training to protect natural resources and wild life.  
- Spoil area will be properly selected and treated to protect farm land and other facilities, by consultation with local EPB.                                                                               | Contractor     |      |
| 5. Cultural relics            | In case cultural relics is discovered construction should be stopped and should not be resumed again until proper measures have been taken under supervision by experts from cultural relics protection department.                                             | Contractor HPCRB |      |
| 6. Labour camp                | Septic tank sewage treatment facility will be built. The silts in the sewage tank will be disposed regularly. The drinking water quality should be up to the World Health Organization standard.                                                      | Contractor     |      |
| 7. Transport management       | - Routing for materials transport will be selected carefully, to reduce interference with the existing traffic as much as possible, and reduce dust and noise pollution.  
- To improve traffic management to reduce congestion.  
- To build temporary detour road.  
- To formulate proper transport time schedule, to avoid peak hour.                                                                                                                   | Contractor     |      |
| 8. Construction safety        | - To provide proper lighting, safety signs and markings for detour road and to formulate provisional traffic rules for temporary road.  
- To take effective safety and warning measures for earth and stone cutting and filling engineering.                                                                           | Contractor     |      |

HPCRB: Hubei Provincial Cultural Relic Bureau
## Summary of action plan for Hubei province national road project III (Operation period)

<table>
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<tr>
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</tr>
</thead>
</table>
| 1. Noise and air pollution   | - Ban unnecessary use of horn at night time.  
- Green belt plantation along air quality sensitive area, and noise barrier and other noise insulation measures for noise sensitive areas. | HPHHMB         |      |
|                              |                                                                                                 | HPEPB          |      |
| 2. Vehicle management        | - Strengthen vehicle maintenance and management to make it in good condition.  
- Strengthen enforcement of vehicle noise and emission regulation.  
- Enforcement of the speed limit regulation.  
- Personnel training & public education to understand environmental regulations. | HPHHMB         |      |
|                              |                                                                                                 | HPEPB          |      |
| 3. Dangerous goods spills    | - First aid team leading group and first aid team will be organized with feasible emergency response program to cope with contingent accident.  
- Enforcement of regulations concerned with dangerous goods transport.  
- In case there are dangerous goods spills, it should be resolved in accordance with emergency program. | HPHHMB         |      |
|                              |                                                                                                 | HPEPB          |      |
|                              |                                                                                                 | HPPSB          |      |
| 4. Environmental monitor     | It will be done according to the standards and methods specified by NEPA, see Table 4-3-1.       |                |      |

HPHHMB: Hubei Provincial High-grade Highway Management Bureau  
HPPSB: Hubei Provincial Public Security Bureau;