

WB-Funded Project

**Han River Inland Waterway Improvement Project
in Hubei
(Yakou Navigation Complex Project)**

Reservoir Embankment Reinforcement Works

**Environmental and Social
Management Plan (ESMP)**



中南勘测设计研究院有限公司
ZHONGNAN ENGINEERING CORPORATION LIMITED

July 2017

Contents

1 Introduction	1
2 Purpose of the ESMP	3
3 Scope and Structure of the ESMP	4
3.1 <i>Project Location, Functions and Scale</i>	<i>4</i>
3.2 <i>Structure of ESMP</i>	<i>5</i>
4 Regulatory Framework	6
4.1 <i>Environmental Laws and Regulations</i>	<i>6</i>
4.2 <i>World Bank Safeguard Policies</i>	<i>8</i>
4.3 <i>Contractor Obligations</i>	<i>9</i>
5 Environmental and Social Impacts and Mitigation Measures.....	10
6 Environmental Monitoring Plan	23
6.1 <i>Purpose and Tasks</i>	<i>23</i>
6.2 <i>Environmental monitoring plan.....</i>	<i>23</i>
7 Environmental Management and Supervision.....	26
7.1 <i>Environmental management plan (EMP)</i>	<i>26</i>
7.2 <i>Environmental Supervision.....</i>	<i>28</i>
8 Environmental Protection Investment	33
8.1 <i>Cost Composition</i>	<i>33</i>
8.2 <i>Environmental protection investment</i>	<i>33</i>
8.3 <i>Total investment of water and soil conservation.....</i>	<i>36</i>
Appendix 1: Construction Environment Specifications of Contractors	38
Appendix 2: Management Plan of Hazardous Materials and Wastes	68

Tables:

Table 3-1 Xiangyang Han River Embankment Reinforcement Scope

Table 3-2 Yakou Navigation Complex Reservoir Embankment Reinforcement Works

Table 3-3 Quantities of Han River Yakou Reservoir Section Embankment Reinforcement

Table 5-1 Environmental and Social Management during Construction and Operation of Reservoir Embankment Reinforcement Works

Table 7-1 List of Major Environmental Supervision Work on Site during Construction

Table 8-1 Investment Estimates of Environmental Protection for Han River Embankment Reinforcement

Table 8-2 Summary of Water and Soil Conservation Investment Estimates

Figures:

Figure 1-1 Scope of Yakou Reservoir Embankment Reinforcement Work

Figure 3-1 Map of Han River Embankment Reinforcement Project (in Xiangyang)

1 Introduction

Han River embankment reinforcement works is associated with Han River Yakou Navigation Complex Project, which will be carried out under the responsibility of Xiangyang Water Resources Bureau and Xiangyang Waterway Administration.

Han River is wandering in plain area in middle and lower reaches, and embankments were built on both banks to protect farmland and towns. The existing Xiangyang embankment of Han River is located within the administrative territory of Xiangyang. It protects arable land of 1.121 million mu and a population of 2.434 million. Based on the *Feasibility Study Report of Han River Embankment Reinforcement Project (in Xiangyang)*¹ prepared in October 2015, this report has been reviewed and approved by the relevant authorities. The design standard for flood defense in the middle and lower reaches of Han River is based on the catastrophic flood in 1935 (flood recurrence interval: 100 years), and that for embankment of mainstream of Han River is based on the flood in 1964.

In Yakou reservoir area, namely, between Cuijiaying and Yakou Complex, there are 3 sections of embankment which are listed in the Han River Embankment Reinforcement Project (in Xiangyang): Oumiao (Xiangcheng), Hedong (Yicheng) and Yicheng urban embankment. The elevation of the embankment is generally 1.0~2.0m higher the flood level in 1964 (equal to 20-year return period), and *the total length is about 86.7km*. Along other river sections the terrain is tableland, which meets the flood prevention requirement. Based on the size and importance of the served area, according to relevant standards and specifications, the Oumiao embankment, Hedong embankment and Yicheng urban embankment are all defined as Class 2. Scope of Yakou Reservoir Embankment Reinforcement Work is shown in Figure 1-1.

Data source: Feasibility Study Report of Han River Embankment Reinforcement Project (in Xiangyang), Hubei Provincial Water Resources and Hydropower Planning Survey and Design Institute, 2015

Xiangyang Water Resources Bureau will carry out the embankment reinforcement on both banks of the reservoir section of Han River. As Yakou Complex is applying for financing from the World Bank, our company, entrusted by Port and Waterway Administration of Hubei Transportation Department in December 2015, is required to prepare the ESMP for Yakou Reservoir Embankment Project based on WB's safeguard policies to provide support to Yakou project.

This ESMP is prepared on the basis of the conclusions and comments in supplemental EIA report and the best environmental management practices. This ESMP will be taken as an appendix to the contract documents of the contractor and constitute part of the legal document of loan agreement with World Bank. This is the second draft of ESMP.

¹ Han River Embankment Reinforcement Project (in Xiangyang) includes 9 sections, i.e. Laohekou urban embankment, Hongshan embankment, Taipingdian embankment, Xiangyang downtown left embankment and Yicheng Hedong embankment, which are located on the left bank of Han River, as well as Xiangyang downtown right embankment, Oumiao embankment, Gucheng Wangmatao embankment and Yicheng urban embankment, which are located on the right bank . The total length is 142.747km.

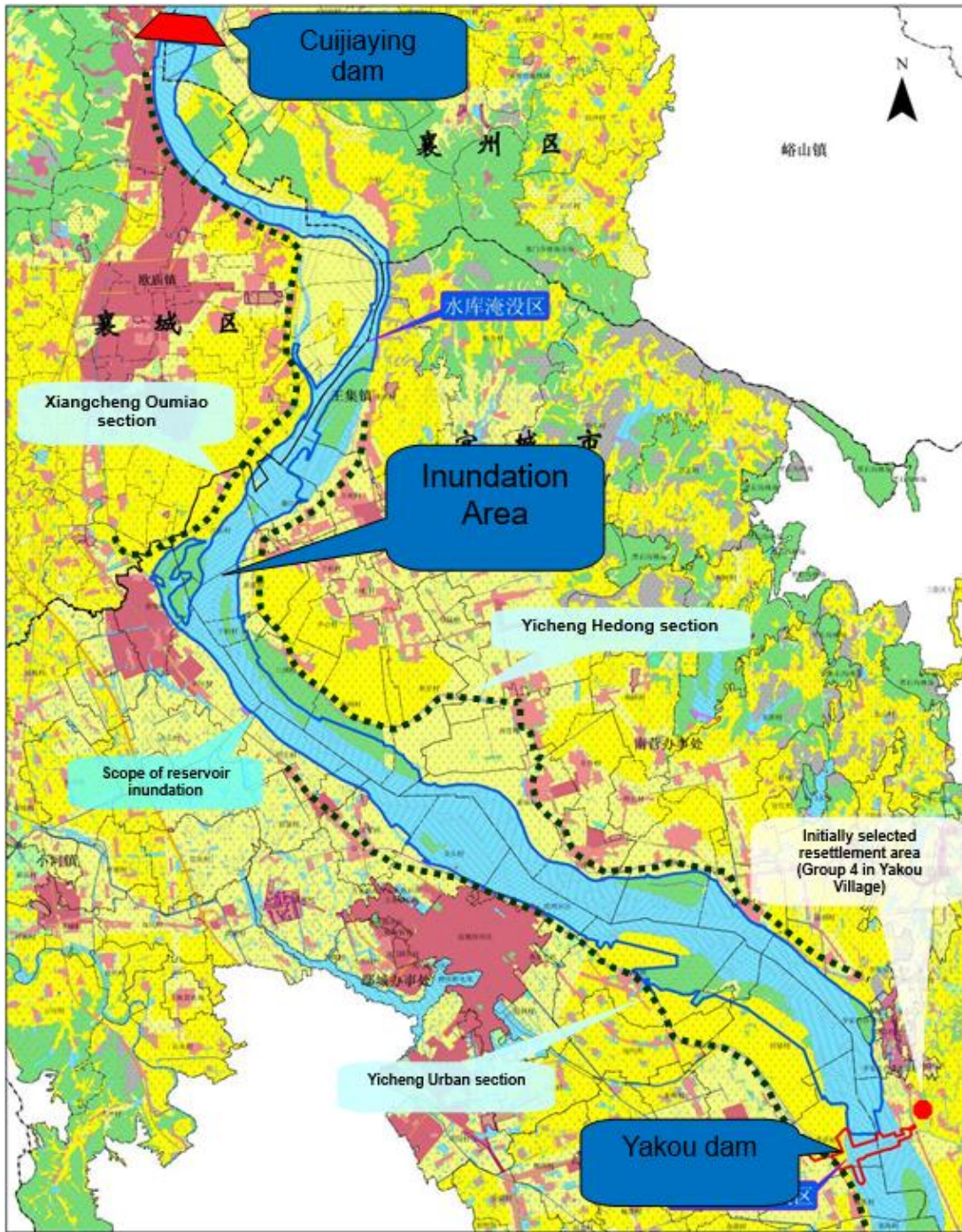


Figure 1-1 Scope of Yakou Reservoir Embankment Reinforcement Work

2 Purpose of the ESMP

Hubei Han River Embankment Reinforcement Project (in Xiangyang) is an important flood control and security assurance project. Its implementation plays an important role in protecting life and property in local area in Han River basin, and in safeguarding normal production and life, as well as in protecting regional ecological environment and promoting sustainable development of society and economy in the region.

The EIA of this project indicates that the project implementation will not cause significant change of hydrological regime and has only limited impact on river habitat and ecology. The adverse project impact on environment can be effectively reduced or mitigated by enhancing the environmental management during construction and carrying out the ecological restoration and compensation measures proposed by the EIA. The main adverse environmental impact of this project includes the impact of “waste gas, waste water and waste solid as well as noise”, loss of land resources and impact on ecological environment; however, except for the loss of land resources, other adverse impacts last only for a short period of time and in a limited area. Appropriate measures and enhanced management during construction can avoid or reduce the impact.

This environment management plan will give a detailed description of contents regarding environmental impact mitigation measures, environmental management, environmental supervision and environmental monitoring. It will serve as instructional document for carrying out these activities. Its functions are as follows:

(1) Clarify environmental impact mitigation measures on the affected targets. Xiangyang Water Resources Bureau, Xiangyang Waterway Administration, the EIA unit and the design institute carry out detailed field verification and confirmation on the affected target, propose effective environmental impact mitigation measures and put them in the engineering design.

(2) Provide instructional document regarding environment. This environmental management plan, upon inspection of the World Bank, will be provided as environmental protection guideline to the construction supervision organization, environmental surveillance unit and other relevant units in the construction and operation period

(3) Clarify responsibilities and functions of relevant units. The responsibilities and functions of relevant functional departments and administrative authorities will be clarified and the communication channels as well as methods between them will be proposed.

(4) Propose environmental monitoring plan during the construction and operation period. In order to ensure effective implementation of the environmental impact mitigation measures and handle unprecedented or sudden environmental problem as early as possible, this environmental management plan proposes the environmental monitoring plan in the construction and operation period.

3 Scope and Structure of the ESMP

3.1 Project Location, Functions and Scale

The Yakou Navigation Complex backwater impact scope includes 3 sections, Xiangcheng Oumiao embankment, Yicheng urban embankment as well as Yicheng Hedong embankment, accounting for 86.739km in total. In order to prevent backwater impact, the water resources department will implement embankment consolidation and this project will be carried out concurrently with the Yakou Navigation Complex project.

Table 3-1 Yakou Navigation Complex Reservoir Embankment Reinforcement Project

S.N.	Name of protection area	Embankment length of protection area (km)	Flood-control standard (year)	Project grade
1	Xiangcheng Oumiao section	18.922	20	Grade 2
2	Yicheng city urban section	33.516	20	Grade 2
3	Yicheng Hedong section	34.301	20	Grade 2

The embankment project will serve as passageway for checking dangerous condition and emergency material transportation during flood season. The width of the embankment top for Xiangcheng Oumiao embankment, Yicheng Hedong embankment and Yicheng urban embankment is decided to be 6m. And their top road pavement width is decided to be 4.5m. Concrete pavement will be adopted for the urban embankment section on the top, and clay bound macadam pavement is used for other embankment sections. Embankment foundation seepage control design is based on different geological conditions to use different methods including landside seepage berm inside embankment, deep-seated cement and soil mixing pile wall established for embankment top, and cone penetration grouting for embankment body. This project mainly adopts smooth revetment form and some embankment sections adopt wall-type embankment. Concrete revetment is used for the part above the designed low water level, and smooth grit guard is adopted for the part below the designed low water level. The main quantities are shown in Table 3-2.

Table 3-2 Quantities of Han River Yakou Reservoir Section Embankment Reinforcement

S.N.	Main project content	Xiangyang Oumiao section Right bank	Yicheng Hedong section Left bank	Yicheng Urban section Right bank	In total
1	Embankment consolidation (km)	18.922	34.301	33.516	86.739
2	Embankment top flood control road (km)	18.922	30.301	33.516	82.739
3	Protection outside embankment (m)	18922	4000	4572	27494
4	Embankment body leveeing up (m)	18922	0	0	18922
5	Embankment body cone penetration grouting (m)	16322	25101	30316	71739

S.N.	Main project content	Xiangyang Oumiao section Right bank	Yicheng Hedong section Left bank	Yicheng Urban section Right bank	In total
6	Embankment foundation seepage control (km)	4.3	0	3.2	7.5
7	Yuantang backfill (m ²)	20000	71198	13000	104198
8	Cross-embankment culverts and sluices (ea.)	3	6	7	16
9	Small water pipe (pipe culvert) (ea.)	0	2	1	3

3.2 Structure of ESMP

This ESMP is divided into 8 chapters:

Chapter 1 is the introduction, which briefly introduces the background information of the proposed project and the background for preparing the ESMP;

Chapter 2 is the purpose of the ESMP, which determines the main purpose of this ESMP;

Chapter 3 is the scope and structure of the ESMP, which introduces the scope that this ESMP covers and the way the contents of this document is organized;

Chapter 4 is the Regulatory Framework, which introduces the overall Regulatory Framework applicable to this ESMP;

Chapter 5 is the Environmental and Social Impact and Mitigation Measures, which specifically explains the potential project impact on environment and society and the mitigation measures based on the original EIA report and the supplemental EIA report;

Chapter 6 is the environmental monitoring plan, which drafts detailed environmental monitoring plan to better understand the executions of the ESMP during the entire project cycle;

Chapter 7 is the environmental management plan and environmental supervision, which clarifies the structure, responsibilities and tasks of the ESMP implementation organization, as well as the scope, work content and work method of the environmental supervision in order to ensure the fulfillment of given environmental goals during the project implementation and operation;

Chapter 8 is the environmental protection investment estimate, which clarifies the cost estimates and fund sources for the proposed environmental and social impact mitigation measures (including environmental monitoring and environmental management).

Except for the text, this ESMP also presents main engineering and non-engineering measures to be carried out during the construction by the contractors in the appendix, which consist of a series of general environmental protection plans, serving as foundation of good practice of environmental management in construction activities. The appendixes include:

Appendix 1: Construction Environment Specifications of Contractors

Appendix 2: Management Plan of Hazardous Materials and Wastes

4 Regulatory Framework

4.1 Environmental Laws and Regulations

A) Laws and administrative regulations

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

Environmental Protection Law of the People's Republic of China (January 1, 2015)

Water Law of the People's Republic of China (October 1, 2002)

Port Law of the People's Republic of China (January 1, 2004)

Water Pollution Control Law of the People's Republic of China (June 1, 2008)

Air Pollution Control Law of the People's Republic of China (September 1, 2000)

Environmental Noise Pollution Control Law of the People's Republic of China (March 1997)

Solid Waste Pollution Control Law of the People's Republic of China (April 1, 2005)

Soil and Water Conservation Law of the People's Republic of China (March 1, 2011)

Clean Production Promotion Law of the People's Republic of China (January 1, 2003)

Forest Law of the People's Republic of China (April 29, 1998)

Wild Animal Protection Law of the People's Republic of China (April, 1998)

Fishery Law of the People's Republic of China (August, 2004)

Flood Control Law of the People's Republic of China (January 1, 1998)

Environmental Protection Management Regulations of Construction Projects (State Council Decree No. 253, November 1998)

Waterway Management Regulations of the People's Republic of China (State Council Decree No.3, June 1988)

Letters Regarding Printing and Distributing Technical Policy Seminar Memorandum for Water Environment and Ecological Environmental protection of Water Conservancy and Hydropower Project (HBH [2006] No.11)

Regulations on Pollution Prevention Management of Drinking Water Protection Zone
(July 10, 1989)

Notice about Further Enhancing Drinking Water Source Security Safeguarding (HB [2009] No.30)

Notice of the State Council Office about Enhancing Drinking Water Security Safeguarding (GFB [2005] No.45)

Environmental Protection Regulation of Hubei Province (December 1997)

Decisions of the Provincial People's Government on Implementing Enhancement of environmental Protection in a Scientific Development Perspective (EZFB [2006] No.54)

Notice of the Provincial Environmental Protection Bureau on Further Enhancing the Work of Construction Project Environment Management across the Province (EHF [2008] No.56)

Method of Hubei Province for Implementing Water Pollution Prevention and Control Law of the People's Republic of China (December 1, 2000)

Notice of Provincial People's Government Office Regarding Enhancing and Regulating Management of Newly Commenced Project (EZBF [2008] No.9, February 2008)

Comments of Provincial People's Government Office Regarding Further Enhancement of Water Pollution Prevention and Control (EZBF [2008] No. 49)

Notice of Hubei Provincial People's Government Regarding Dividing Key Prevention and Control Zone for Water and Soil Loss (EZFB [2000] No.47)

Method of Hubei Province for Implementing Wild Animals Protection Law of the People's Republic of China (October 12, 1994)

Notice about Further Promoting the Work of Construction Project Environmental supervision Pilot (Office of Ministry of environmental Protection, HB [2012] No.5)

Distribution of Notice on Hubei Province Surface Water Environment Function Types of the Provincial Environmental Protection Bureau by Provincial People's Government Office (EZBF [2000] No.10, January 2000)

Notice of Provincial People's Government Office about Printing and Distributing Scheme of Centralized Drinking Water Source Protection Zone above County Level (EZBF [2011] No.130, December 2011)

4.2 World Bank Safeguard Policies

The requirement of the World Bank includes ten basic safeguard policies. The summary of compliance of this project with the World Bank safeguard policies is shown in the following table. The designated contractors and subcontractors involving in the activity of Yakou Navigation Complex project shall abide by the corresponding environment and social security safeguard policies of the World Bank, especially the following operational policies / bank procedures.

Table 4-1 Analysis of Compliance of This Project with World Bank Safeguard Policies

Safeguard policy	Applicable or not	Compliance
Environmental assessment (OP / BP4.01)	Yes	<ul style="list-style-type: none"> • Category A , environmental and social impact assessment has been carried out; • EIA documents include: 1) the original EIA Report; 2) supplemental ESIA report; 3) the ESMP of the complex and other auxiliary works; 4) the ESMP for embankment reinforcement of reservoir area; 5) ESIA executive summary; • Multiple activities of public consultation have been carried out according to OP4.01 and the full text of EA Reports have been disclosed.
Natural habitats (OP/BP4.04)	Yes	<ul style="list-style-type: none"> • Survey on aquatic and terrestrial ecosystem has been implemented and potentially affected natural habitats and targets of ecological protection have been identified; • Potential impacts of the project on natural habitats and ecological sensitive areas and fish have been assessed; • Protective measures on the habitats, including protection on fish habitats, fish pass and ecological operation and so on; • The project will not cause remarkable degradation or conversion of key habitats.
Pest Management (OP4.09)	No	No procurement and use of pesticides is involved in this project.
Physical cultural resources (OP/BP4.11)	Yes	<ul style="list-style-type: none"> • Survey on cultural relics has been done and ancient tombs were identified in the project affected area. These ancient tombs will not be affected by the project construction but be subject to the inundation or erosion of impoundment of reservoir; • Physical cultural resources protection plan has been formulated • "Chance-find" measures of cultural relics have been included into environmental management plan

Dam safety (OP/BP4.37)	Yes	• Dam safety plan has been prepared
Forestry (OP/BP4.36)	No	No forest in the project affected areas, so this policy is not applicable.
Involuntary resettlement (OP/BP4.12)	Yes	Resettlement Action Plan has been prepared.
Indigenous peoples (OP/BP4.10)	No	No ethnic minorities in the project affected areas and this policy is not applicable.
Project in controversial areas (OP/BP7.60)	No	No controversial areas in the project affected areas and this policy is not applicable.
Projects on International Waterways (OP/BP7.50)	No	No international waterway projects in the project affected areas and this policy is not applicable.

Besides, this report also fully uses the EHS Guidelines of the World Bank as references.

4.3 Contractor Obligations

The designated contractors and subcontractors involving in Yakou project shall abide by any other environmental or social obligations that may be specified in the project contract document but may not be contained in the laws and regulations of China.

If there is discrepancy between the laws and regulations of China and the contract document, the activity of the Yakou Navigation Complex project shall execute the most stringent standards.

5 Environmental and Social Impacts and Mitigation Measures

Based on the main findings of the *EIS of Han River Embankment Reinforcement Project (in Xiangyang)* (January 2016) and the *Supplemental EIA Report of Han River Yakou Navigation Complex Project* (July 2016), this chapter summarizes all the major environmental and social impact as well as corresponding mitigation measures / action plans of the reservoir area embankment project and has developed an ESMP for the Yakou Navigation Complex project reservoir area embankment project. The plan clarifies the implementation date and budget of various measures as well as the implementation and monitoring organization. It also established monitoring indexes and frequencies to monitor and control the implementation effect of corresponding measures so that necessary actions can be taken promptly for enhancement or adjustment to ensure the fulfillment of given environmental and social goals of the project. The mitigation measures will be incorporated in the designed design, bidding document as well as project management manual, and carried out by the design institute (DI), contractor and implementation organization under the surveillance of the PMO, local environmental protection authority as well as the project panel of experts. The effectiveness of these measures will be assessed according to the environment inspection and monitoring results to determine if these measures should be continued or improved/adjusted.

The length of Xiangyang Han River reinforcement section is designed to be 163.466km, where the left bank embankment is 96.628km and the right bank embankment is 66.838km. The embankment project related to the Yakou Navigation Complex reservoir area includes 3 sections, Xiangcheng Oumiao embankment, Yicheng urban embankment as well as Yicheng Hedong embankment, accounting for 86.739km in total.

As the project implementation cycle is relatively long and it involves different project areas, this chapter will give description on different project areas such as project construction area and resettlement area according to the three project phases: preparation, construction and operation. The project contractors can implement corresponding ESMP according to the content in corresponding table in the project implementation stage.

Except that the construction of the Yicheng embankment is already finished, the construction time of other subprojects are not finally determined yet. These subprojects have not been implemented yet. See Table 5-4 for the ESMP of the reservoir embankment project.

Table 5-1 Environmental and Social Management during Construction and Operation of Reservoir Embankment Reinforcement Works

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Resettlement	<ul style="list-style-type: none"> • The residents relocated as a result of this project will be resettled in the same village. Their original living habit and ways of production will remain the same, so the discomfort arising from resettlement can be mitigated. The living conditions and environment of the relocated residents after resettlement will be improved, which will reduce the morbidity rate of infectious diseases, and thus be favorable to the health of the resettled residents. However, during the resettlement, over-fatigue will lead to reduction of anti-disease capacity or common diseases such as enteric infectious disease, which may go epidemic as a result of life instability. • For arrangement of production for the relocated residents as a result of this project, the arable land will be adjusted. No land development will be involved. The production arrangement has relatively small impact of the ecological environment in the resettlement area. 	<p>The drinking water source protection and management of the resettlement area will be enhanced. Water quality test will be conducted on a regular basis to ensure drinking water quality. Hygiene publicity, surveillance and improvement of medical facility shall be enhanced. Meanwhile, the project shall be combined with the local county (city) water and soil conservancy planning as well as carry out forestation and greening of environment in the rural resettlement area, towns and special facility construction area.</p>	PIU and local government	Government at upper level, local hydro conservancy, environmental protection and land resources departments	See the resettlement planning fitted with the reservoir area embankment project

Environment / social content		Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Ecological environment	Terrestrial organism	<ul style="list-style-type: none"> • The impact of the project on terrestrial plants mainly includes damage to surface vegetation by the civil work. The terrestrial vegetation affected is very common and extensively distributed in surrounding areas. There is no possibility of leading to disappearance of plant population as a result of local vegetation loss. • Upon the completion of the project, the vegetation inside the embankment will be better protected to escape the impact of flood. Meanwhile, the improvement of flood prevention capacity can reduce the loss of plant biomass that might have been otherwise drowned, especially loss of crops. • Upon the completion of the project, the types of permanently occupied land mainly include paddy field, dry land and forest land, leading to change of production capacity and stability of the natural ecological system in the region. The productivity of the natural system in the assessment area will be reduced but the reduction is not significant and has only little impact on the resilient stability and impedance stability of the natural system in the assessment area. 	<p>(1) Ecological impact mitigation measures: try to avoid or reduce occupation of farm land and reduce damage to the natural ecology and vegetation along the line when selecting site for temporary construction road route, construction camp and stockyard.</p> <p>(2) Ecological impact restoration and compensation measures: the permanent land occupation of Han River Embankment Reinforcement project will be incorporated in the land scope of embankment management after the project is implemented. Upon the completion of each relevant section, slope protection and construction site vegetation restoration measures shall be carried out as soon as possible. The land that can be greened within the scope of embankment management shall be fully utilized for planting suitable herbaceous plant and protecting woods. For forest land and arable land temporarily occupied by Earth Borrow Area and construction facilities, after the construction is finished, the land will be restored based on the nature of the original land use. Meanwhile, management and supervision on forest and vegetation shall be enhanced to reduce vegetation loss caused by land occupation.</p> <p>(3) Measures such as ecological management: during the construction, enhance environmental protection publicity and education by means of public notice, leaflet, blackboard newspaper and meeting to enhance environmental protection awareness. Constructors are forbidden to be engaged in activities that hinders ecological environmental protection. Project Environmental supervision bylaws shall be established. Responsible for inspecting and supervising various measures in the project environmental protection design regarding ecological protection and ecological restoration to ensure implementation of various environmental protection measures.</p>	Project contractors	Xiangyang Municipal Environmental Protection Bureau and the Municipal Water Resources Bureau	Investigate the overall terrestrial vegetation in the project affected area, including the area of vegetation of woodland and meadow, changes of forest type, and the growth of bushes and meadow. Carry out monitoring once during construction preparation, upon completion and 1 year after the restoration of the construction site.

Environment / social content		Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
	Terrestrial animals	<ul style="list-style-type: none"> The main impact of the project construction on terrestrial animals is that the damage of terrestrial habitat will force the animals to migrate to similar habitat around, but the animals in the area are common small animals with strong adaptive ability. The project construction only temporarily changes the distribution of these animals in the construction area and the peripheral area and will not post treat to its survival. During the project construction, basically no impact will be generated on reptiles and amphibians. Major protected birds in the embankment area around surface water may be affected by the constructions more or less, but these birds can fly and adapt, so they may fly to surrounding similar habitat. Overall, noise generated during construction may cause the birds to move to an area of similar habitat, but the construction will not generate impact on the number of birds population and their diversity of species. The embankment heightening and reinforcement are conducted on the original embankment foundation. 	<p>(1) Measures of mitigating or avoiding ecological damage: carry out construction strictly within the land acquisition scope to reduce occupation and trampling on surrounding woodland as well as damage of natural ecology and vegetation to avoid affecting the living environment and habitat of animals. Try to keep shoals and moors around the embankment, which is the demonstration of riverbed diversification and provides habitat for the growth of amphibians and wetland birds.</p> <p>(2) Measures of mitigating ecological impact: carry out pegging and demarcation in each construction area. Establish wild fauna and flora protection warning signs in each construction area. It is prohibited to hunt wild animals and engage in other activities that may hinder ecological environmental protection. Should any rare species be found, carry out protection promptly.</p> <p>(3) Measures such as ecological management: during the construction, enhance environmental protection publicity and education and the publicity of common sense of wild animals protection by means of public notice, leaflet, blackboard newspaper and meeting to enhance environmental protection awareness. The constructors are prohibited to hunt wild animals including frogs, snakes, beasts and birds. Carry out measures of ecological environment management and prepare ecological protection rules for constructors during construction. Enhance management of constructors and supervise as well as urge them to work safely and in a civilized way. Project Environmental supervision bylaws shall be established, especially for enhancing protection of river shoal and woodland outside the embankment for migratory birds to inhabit or find food from to ensure the fulfillment of the project environmental protection goals and no threat being posed to the survival of wild animals.</p> <p>(4) Protective measures for major protected wild animals: improve construction technology and try to use low-noise construction equipment to reduce noise intensity. Arrange the operation ways and time frame of construction machine in a reasonable way to avoid disturbance to birds and other animals for finding food, inhabiting and breeding. Upon the completion of the project, try to restore the surface vegetation as soon as possible to maintain habitat</p>	Project contractors	Xiangyang Municipal Environmental Protection Bureau and the Municipal Water Resources Bureau	-

Environment / social content		Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
	Aquatic ecosystems	<ul style="list-style-type: none"> • The impact of project construction on planktons and benthonic animals is mainly manifested in reduction of biomass and number of planktons and benthonic animals in local waters. But such adverse impact generated by the construction is relatively small as the project is constructed section by section with relatively small scale and the planktons and benthonic animals are mostly ubiquitous species. • Underwater riprap protection of bank and transportation ship navigation may cause disturbance or crash to fishes and subsequently reduce fish density in the construction area. Concurrently, the increase of suspended matter concentration in local river section may cause some impact on the fish fries in the river. But no impact will be caused on the quantity and species of fish resources. • Neither centralized fish spawning site nor rare or endangered aquatic organism is found in the nearshore waters involved in the project area. There are only a small amount of fishes that produce viscid eggs. When the project is constructed and put into operation, almost no situation of flow and sediment diversion will be caused, nor will the water regime as well as eco-hydrological processes be changed; and basically, there is no change of habitat of fishes and food organism in the river way. Therefore, the project operation basically has no impact on aquatic organisms. 	<p>(1) Enhance publicity and education: the aquatic organisms in the waters involved in the project are ubiquitous species. Impact on the species resources upon the completion of project will not affect the survival of the species.</p> <p>Starting from the perspective of ecological and environmental protection, prior to construction commencement, the contractor shall do well in preparatory work of construction planning, carry out publicity and education of aquatic organism protection on constructors and strictly prohibit fishing and waterfowl hunting in the construction river section.</p> <p>(2) Optimize construction plan: regulate earthwork construction management during the construction to reduce the possibility of soil loss and avoid impact on waters. Arrange construction time in a reasonable way. Try to avoid disturbance to waters and impact on fishes passing this river section, especially the underwater riprap protection of bank, which shall be carried out between September to March next year if possible.</p> <p>(3) Enhance treatment of construction wastewater and domestic sewage: enhance various hygienic management of constructors (such as personal hygiene, faeces and domestic wastewater), avoid direct discharge of domestic sewage into river to avoid pollution to waters; do well in ecological restoration of the shoal Earth Borrow Area outside embankment upon completion to avoid adverse impact on aquatic organism habitat as a result of waters pollution due to soil entering river.</p>	Project contractors	Municipal Environmental Protection Bureau	

Environment / social content		Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Ecological environment	Environment Sensitive Area	The project construction is not involved in natural reserves nor fisheries germplasm resources conservation zone. The ecological structure and functions will not be changed. No direct adverse impact will be generated on the fisheries germplasm resources conservation zone in this region.	<p>(1) Establishing warning signs: during the construction, establish wild fauna and flora protection warning signs. It is prohibited to hunt wild animals and engage in other activities that may hinder ecological environmental protection. Should any rare species be found, carry out protection promptly.</p> <p>(2) Enhance publicity and education: during project construction, enhance publicity and education of ecological protection on constructors by means of public notice and distributing brochures to increase everyone's environmental protection awareness and mitigate or reduce impact of the project construction on local terrestrial and aquatic fauna and flora.</p> <p>(3) Enhance construction management and supervision: carry out measures of ecological environment management and prepare ecological protection rules for constructors during construction. Enhance management of constructors and supervise as well as urge them to work safely and in a civilized way. In order to ensure smooth implementation of project and implementation of various environmental protection measures, project environmental supervision bylaws shall be established. Responsible for inspecting and supervising various measures in the project environmental protection design regarding ecological protection and ecological restoration.</p> <p>(4) Protective measures for major protected wild animals: improve construction technology and try to use low-noise construction equipment to reduce noise intensity. Arrange the operation ways and time frame of construction machine in a reasonable way to avoid disturbance to birds and other animals for finding food, inhabiting and breeding. Upon the completion of the project, try to restore the surface vegetation as soon as possible to maintain habitat suitable for wild animals.</p>	Project contractors	Municipal Environmental Protection Bureau	

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Water and soil loss	Project construction will increase local water and soil erosion, especially in rainy season.	The project area is divided into 7 prevention and control zones. Meanwhile, based on the principle that preventive measures are combined with control measures, engineering measures are combined with vegetation measures, and permanent measures are combined with temporary measures, according to specific characteristics of water and soil loss in each prevention and control zone, engineering measures, vegetation measures and temporary measures are arranged according to local conditions. Strictly execute the water and soil conservation plan of the project	Project contractors	Municipal Water Resources Bureau	The key water and soil conservation monitoring area includes Earth Borrow Area and principal project construction area. Therefore, 7 monitoring points are established at the construction areas that may cause severe water and soil loss for observation at fixed points and locations.

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Population health	<ul style="list-style-type: none"> The embankment reinforcement project construction zones are distributed along the embankment, while in the shoals outside the embankment are places easy to catch schistosomiasis or oncomelania distribution area. During the construction, especially in the early period of construction, constructors' health will be affected by prevalence of waterborne infectious disease and epidemic diarrhea such as hepatitis, dysentery, and typhoid because a lot of constructors gather in the construction area and the living water facilities and temporary hygienic facilities are not complete, also the living conditions, hygienic conditions and drinking water hygiene of the constructors can not be guaranteed. 	<p>(1) Schistosomiasis prevention measures: the hydro project will combine oncomelania elimination measures: based on the requirement of schistosomiasis prevention, new or built gate station and pump station that are already provided with irrigation function shall consider adoption of oncomelania elimination measures to prevent oncomelania spreading from outside to inside of embankment. Corresponding oncomelania elimination measures are prepared in areas such as Earth Borrow Area, earthwork filling area and construction zones.</p> <p>Physical examination for schistosomiasis prevention: constructors entering construction zones shall be physically examined on a regular basis. Schistosomiasis pathogen carrier shall be screened. Immunological method will be adopted for physical examination of schistosomiasis prevention. Carry out once before entering the construction site annually, and once after the completion of construction. Protection of constructors: during acute schistosomiasis infection period, prophylactic may be distributed to the constructors who may be exposed to infected water. Distribute protective boots and schistosomiasis prevention clothes to the workers who may be exposed to infected water to avoid direct contact with infected water. Schistosomiasis prevention publicity and education: before the commencement of project, carry out all-round health protection publicity to enable the constructors to understand the hazard of schistosomiasis, infection paths and preventive measures, increase self-protection awareness and reduce the probability of infection.</p> <p>(2) Epidemic prevention: prior to construction, carry out hygienic cleaning in the construction area to provide relatively hygienic living conditions for the constructors. Carry out health quarantine on the new comers in the construction area. The epidemic prevention is focused on infectious disease.</p> <p>(3) Enhance dietetic hygiene management and supervision: execute the bylaw of "hygiene permit" to ensure dietetic hygiene. Boiling water supply points shall be established based on the actual condition of the construction on site to ensure the drinking water hygiene and safety of constructors.</p> <p>(4) Public hygiene in construction area: prior to</p>	Project contractors	Xiangyang Municipal Health Bureau	<p>Monitoring schistosomiasis: monitor schistosomiasis epidemic area and oncomelania breeding. Prior to construction, check oncomelania in all the construction occupation areas. After the construction, check oncomelania in temporary occupation area. The main purpose is to understand the changes of oncomelania present area as a result of project construction.</p> <p>During the project construction, carry out physical examination on the constructors for schistosomiasis. Spot check 10% of the constructors annually for schistosomiasis inspection.</p> <p>Routine monitoring: according to the epidemic situation in the region, investigate population density of rats and mosquitoes; investigate morbidity of bacterial dysentery, tuberculosis, typhoid fever and paratyphoid, measles as well as hemorrhagic fever. Carry out sampling detection on the hygienic condition of drinking water and environment health condition as a routine practice.</p>

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Land resources	<ul style="list-style-type: none"> • Temporary land occupation by the project will have some impact on the land resources and land quality in local sections in a short period of time, but such impact will gradually disappear along with the reclamation upon construction completion. • Loss of permanent land occupation is an irreversible impact. However, compared with the cultivated land prior to the project implementation, the impact of permanent land occupation of this project has little impact of the pattern of local land resources utilization, and the impact on the total land quantity occupied is insignificant. 	<p>(1) For cultivated land temporarily occupied that is unavoidable as a result of the construction. Prior to construction the surface plough layer of soil shall be stripped off. Cultivated land temporarily occupied by construction shall be cleaned promptly. Debris such as rocks inside the site shall be cleared off. The plough layer of soil stripped off will be evenly covered on the surface of the reclamation land for supporting hydro facilities and soil ripening on the reclamation land.</p> <p>(2) After the land reclamation work is finished, the land shall be returned to the land owners promptly. Advocate and encourage the farmers who use the reclamation land to apply organic fertilizers properly to keep and cultivate soil fertility.</p>	Project contractors	Municipal Land Resources Bureau	-

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Water environment	<ul style="list-style-type: none"> • Increase of suspended matter concentration in local waters near to the shore as a result of exploitation of Earth Borrow Area and embankment body earthwork filling. • The project construction involved in concrete is scattered in different construction site at each embankment section. The amount of waste water from concrete mixing and washing in each zone is relatively small, which will be treated with sedimentation to standard before being used for spreading or recycled use on construction site. The waste water will not be discharged in the rivers near to the construction zone. • The project construction is relatively scattered and along the inside of the embankment. Also, the scale of every construction site is relatively small. The amount of oily wastewater from construction machine repair and domestic sewage from constructors is relatively small. The wastewater and sewage will be recycled or reused after being treated to standard and will not be discharged into the river section where the construction is. • Seen from the relationship between the construction project and the water intake position, the embankment reinforcement construction intensity and scale are both relatively small, so the construction basically will not generate impact on the water quality in the water source protection zone. 	<p>Please refer to Appendix 1: Construction Environment Specifications of Contractors for relevant mitigation measures in detail.</p> <p>(1) Treatment of alkali wastewater: wastewater collection shall be provided around the concrete mixing system site and concrete block fabrication shop. The collection ditch shall be of rectangular section, liner brick on both sides and the bottom, finished with cement mortar. The upper edge of both sides shall be 0.1m higher than the ground. Sedimentation-neutralization method is adopted. After the alkali wastewater enters the sedimentation tank, add neutralizer concurrently for full sedimentation. Pump clear liquid above after reaction. Clear away sediments manually on a regular basis. The water can be recycled or used for spreading the construction site after treatment of neutralization and sedimentation to standard.</p> <p>(2) Treatment of oily wastewater: make arrangement around the parking lot or garage of construction machine and vehicles Drainage ditch: separately establish small oil separation tanks in each construction site. The oily wastewater from washing machines will be recycled or used for greening after oil-water separation.</p> <p>(3) Treatment of domestic sewage: use septic tank for treating domestic sewage, which will be used for agricultural irrigation after being treated with septic tank.</p> <p>(4) Water quality protection at intake: optimize and break down construction plan. Regulate all the construction activities around the water source protection area. Prohibit discharge of industrial wastewater into the waters of drinking water source protection area. Establish sewage separation screen around the intake. Reinforce water plant outlet management. It is recommended that water plant should prolong the time of water outlet sedimentation and increase the amount of flocculant input at the same time.</p>	Project contractors	Municipal Environmental Protection Bureau	<p>(1) Monitoring of surface water quality Monitored items: pH, DO, CODCr, BOD₅, ammonia nitrogen, potassium permanganate index, petroleums, total phosphorus, total nitrogen, total mercury and volatile penol. Monitoring frequency: monitor once quarterly during construction, and once the first year upon completion.</p> <p>(2) Monitoring of pollution source Establish 1 monitoring point at the alkali wastewater treatment sedimentation tank discharge outlet for concrete washing and curing, oily wastewater treatment tank discharge outlet for machine repair and domestic sewage discharge outlet at temporary living quarters in the 4 construction zones, respectively. Monitored items: mandatory test items for alkali wastewater for concrete washing and curing include pH, and suspended matter; mandatory test items for oily wastewater for machine repair include petroleums and suspended matter; mandatory test items for domestic sewage includes BOD, COD, suspended matter and fecal coliform. Monitoring frequency and time: once during construction peak.</p>

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Sound environment	Most of the embankment sections involved in this project are located in rural area and the residents are scattered. The project impact on sound environment happens in construction period. It is predicted that the boundary noise of each construction zone will meet the standard. The traffic outside the construction site has slight impact on the sensitive receptors on both sides. Construction will not be carried out at night, so, no impact will be generated on the neighborhood. However, construction in the daytime will generate some impact on the neighborhood. The noise level around the residential houses within 90m from the embankment toe will exceed the standards.	Please refer to Appendix 1 : Construction Environment Specifications of Contractors for relevant mitigation measures in detail. (1) Control of noise source Improve construction technology and select low-noise equipment and process. Enhance repair and maintenance of mechanical equipment to reduce operation noise. Enhance control of noise in sound environment sensitive area. Properly prepare transportation route for steel, timber and cement as well as soil and arrange construction time frame in a reasonable way. (2) Sensitive goal protection Take temporary avoidance measures to reduce adverse impact of noise on residents. Meanwhile, prior to project construction, the PIU shall fully communicate with local residents jointly with the contractor, inform the construction plan to the local residents in advance and pay some compensation for the noise to the residents affected by noise to take care of the problem of construction noise.	Project contractors	Municipal Environmental Protection Bureau	Monitoring frequency: monitor once quarterly during construction.
Solid waste	Domestic garbage and industrial waste from construction in the construction area	Entrust local sanitary department to clear away domestic garbage on a regular basis. Meanwhile, require each construction contractor to designate a person to be responsible for collection of industrial garbage. It is strictly prohibited to pile up or scatter garbage in a disorderly way. After construction is finished, carry out cleaning and filling-up for surrounding domestic garbage, outdoor toilet and sewage sump. Use carbolic acid and quicklime for sterilization. And restore the construction land.	Project contractors	Municipal Environmental Protection Bureau	

Environment / social content	Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Atmospheric environment	<p>Most of the construction sections of this project are located in rural area. Some construction embankment sections are occupied with rural residents. The intensity of pollution source affecting air quality is relatively small. The atmospheric pollutants are easy to spread in the construction area. The project construction may generate impact on some residential points on both sides of the construction road and on the residents around the embankment line. However, as the residents live relatively scattered, the construction has relatively small impact as a whole on environmental air sensitive points such as residential points.</p>	<p>Please refer to Appendix 1: Construction Environment Specifications of Contractors for relevant mitigation measures in detail.</p> <p>(1) Measures of dust prevention Try to avoid windy weather for earthwork excavation and concrete construction and take necessary water pouring measures for dust prevention as the case may be. For dust removal during dusty material transportation in sunny and windy weather, when loading soil material, the soil shall be properly wetted and covered with canvas. Storage tanks of vehicles carrying bulk cement shall keep good sealing status. Bagged cement in transportation must be covered and enclosed. When passing densely populated residential area, the speed of the transportation vehicle shall not exceed 15km/h. Watering cart shall be equipped in the construction zone to water the sensitive sections 4 to 6 times where the transportation vehicles pass every day. And the road shall be cleaned at the same time.</p> <p>Dust prevention at material piling: when piling up soil materials, it is preferable that the angle of the pile slope is not large. The dump site shall be compacted promptly. Try to avoid outdoor open stacking of bulk cement if possible. Properly wet the temporarily piled soil outdoors in sunny and windy weather to prevent being blowing away by wind.</p> <p>(2) Control measures of oil-fired exhaust gas Construction machine and transportation vehicle shall be repaired and serviced on a regular basis. They should be promptly cleaned and serviced to ensure their good working state. Enhance management of large construction machine and vehicle. Execute the bylaw of regular inspection and maintenance.</p>	Project contractors	Municipal Environmental Protection Bureau	Monitoring frequency: monitor once quarterly during construction.
II Operation period					

Environment / social content		Impact / matters	Mitigation measures / action plans	Implementation unit	Supervision	Environmental monitoring
Operation period	Economic and social benefit	This project will greatly increase flood control capacity and improve road facilities on both banks, promote sustainable economic development of Xiangyang, and promote regional manufacturing, agriculture and tourism, as well as investment promotion, trade and commerce flow and rapid development of other business.	The impact is positive and no mitigation measures are needed.	/	/	/
	Living quality of residents	As the project is built and put into operation, the project area will be developed into an administrative development center. Relevant departments will develop auxiliary facilities along the project line and vigorously develop entertainment, recreation and tourist resources. The residents will get more employment opportunities and subsequently increase income. This project will bring positive impact on the living quality of local residents.	The impact is positive and no mitigation measures are needed.	/	/	/

6 Environmental Monitoring Plan

6.1 Purpose and Tasks

According to the characteristics of project impact on ecology and environment, monitor the main ecological and environmental factors in the engineering construction area, resettlement area and project affected area; understand the changes of environmental factors and implementation effect of environmental protection, timely find out environmental problems and provide foundations for enhancing environmental protection management, completing project environmental protection work and final acceptance of environmental protection.

During the construction, the monitoring focuses on changes of environmental factors caused by construction activities and resettlement in the construction area and resettlement area.

6.2 Environmental monitoring plan

6.2.1 Monitoring water environment

a) River water quality

Arrangement of monitoring points: one water pollution monitoring point will be established at Taipingdian embankment section, Xiangyang urban section and Yicheng urban section, respectively.

Monitored items: pH, suspended matter, DO, potassium permanganate index, CODCr, petroleum, fecal coliform, 7 items in total.

Monitoring frequency: 3 times at Xiangyang urban section, 2 times at Yicheng urban section, and once at Taipingdian embankment section; 6 times in total.

b) Water quality at urban and rural water intake

Monitoring points: 3 monitoring sections at upstream 500m from Taipingdian water plant intake, Niushou Changshoudao water plant intake and Zhengji water plant intake.

Monitored items: pH, suspended matter, petroleum, DO, potassium permanganate index, five-day BOD, ammonia nitrogen, total phosphorus, fecal coliform, fluoride, volatile phenol, sulfate and iron; 13 items in total.

Monitoring frequency: monitor once quarterly during construction, and increase the frequencies as necessary.

c) Underground water monitoring

Monitoring points: 3 monitoring sections at embankment top vertically 100m from Taipingdian water plant intake, Niushou Changshoudao water plant intake and Zhengji water plant intake.

Monitored items: water level, water quantity, pH, COD, ammonia nitrogen, fecal coliform, total bacterial count and iron; 7 items in total.

Monitoring frequency: once in the 1st, 7th, 12th, and 18th month after construction is finished.

d) Monitoring of pollution source

Arrangement of monitoring points: establish 1 monitoring point at the alkali wastewater treatment sedimentation tank discharge outlet for concrete washing and curing, oily wastewater treatment tank discharge outlet for machine repair and domestic sewage discharge outlet at temporary living quarters in the construction zones, respectively.

Monitored items: mandatory test items for alkali wastewater for concrete washing and curing include pH, and suspended matter; mandatory test items for oily wastewater for machine repair include petroleum and suspended matter; mandatory test items for domestic sewage includes BOD, COD, suspended matter and fecal coliform; properly add or delete items according to the change of pollutants in the wastewater as necessary.

Monitoring frequency and time: once during construction peak.

6.2.2 Monitoring atmospheric environment

Arrangement of monitoring points: 1 monitoring point at Han River main stream Bayi village, Laoxiwan village, Anjiagang village, Heluo village, and Xinglong village, 5 monitoring points in total.

Monitored items: PM10, SO₂, NO₂; 4 items in total.

Monitoring frequency: monitor once quarterly during construction.

Monitoring method: following the requirement and regulation of Ambient Air Quality Standard (GB3095-96) and Specification of Ambient Air Monitoring Quality (tentative).

6.2.3 Monitoring acoustic environment

Arrangement of monitoring points: 1 monitoring point at each construction zone, respectively, 9 monitoring points in total.

Monitoring frequency: monitor once quarterly during construction.

Monitoring method: following the regulations of Sound Environment Quality Standard (GB3096-2008).

6.2.4 Monitoring terrestrial ecology

Monitoring content: investigate the terrestrial vegetation in the project affected area, including the area of vegetation of woodland and meadow, changes of forest type, and the growth of bushes and meadow.

Monitoring frequency: carry out monitoring once during construction preparation, upon completion and 1 year after the restoration of the construction site.

6.2.5 Monitoring water and soil conservation

Monitoring content: water and soil loss in project area, dynamic situation of water and soil loss as well as water and soil loss prevention and control effect.

Arrangement of monitoring points: according to the water and soil loss prediction result, the key monitoring area for water and soil conservation of this project is Earth Borrow Area and principal project construction area. The monitoring zones include: principal project area, construction area and living quarters of embankment management, Earth Borrow Area prevention and control area, dump site prevention and control area, construction camps and auxiliary prevention and control zone, and construction road zone,

as well as temporary soil storage site in each zone. Therefore, 7 monitoring points are established at the construction areas that may cause severe water and soil loss for observation at fixed points and locations.

Monitoring method: it is determined in accordance with Technical Specification of Water and Soil Conservation Monitoring (SL277-2002) combined with the actual situation of this project. The monitoring method shall pursue economic efficiency, applicability and operability.

Monitoring time frame: from construction preparation to design level year, divided into pre-construction preparation period, construction period (3 years) and natural restoration period (1 year).

Monitoring frequency: in the pre-construction preparation period, carry out background value investigation and monitoring combining design document; during construction period, monitor once before and after flood every year, monitor one more time in case 24-hour precipitation $\geq 50\text{mm}$; in the natural restoration period, monitor only the waste dump site, once before and after flood every year.

6.2.5 Monitoring population health

a) Monitoring schistosomiasis

Monitor schistosomiasis epidemic area and oncomelania breeding. Prior to construction, check oncomelania in all the construction occupation areas. After the construction, check oncomelania in temporary occupation area. The main purpose is to understand the changes of oncumelania present area as a result of project construction. During the project construction, carry out physical examination on the constructors for schistosomiasis. Spot check is carried out for 10% of the constructors annually for detecting schistosomiasis.

b) Routine monitoring

According to the epidemic situation in the region, investigate population density of rats and mosquitoes; investigate morbidity of bacterial dysentery, tuberculosis, typhoid fever and paratyphoid, measles as well as hemorrhagic fever. Carry out sampling detection on the hygienic condition of drinking water and environment health condition as a routine practice.

Monitoring frequency: once in early period of construction, in construction peak period, and last period of construction, respectively.

7 Environmental Management and Supervision

7.1 Environmental management plan (EMP)

Environmental management is part of project management as well as an important part of the environmental protection work of the project. The environmental management work during construction and operation of the project must be enhanced and complete environmental management system must be established as soon as possible in order to fully exert the social, economic and ecological benefits of Han River Embankment Reinforcement Project, protect the ecological environment of the construction area and resettlement area, minimize adverse impact to enable positive cycle of ecological environment of the construction area and resettlement area and ensure implementation of every environmental protection measure.

7.1.1 Environmental management organization

(1) Organizational system

To enhance environmental management during project construction and operation, an environmental protection management organization - Environmental Management Office was established. A person will be designated to be responsible for implementation of the EMP as well as environmental protection measures and work related to environmental protection of this project. After the environmental management office is established, work relevant to environmental protection for project construction shall be started promptly and this office shall be in charge of implementation of environmental protection measures and other routine environmental protection work.

(2) Environmental management procedure

The environmental management office is responsible for organizing environmental protection work in the project construction and operation period, negotiating with local environmental protection authorities and accepting the guidance and management of the authorities. The project environmental supervision organization has the right to inspect and supervise the work of the office responsible for implementing the environmental protection. It also has the right to give orders to the project contractors and carry out the intention of the environment management office.

7.1.2 Environmental management duties

The Environmental Management Office shall be responsible for carrying out the environmental protection measures and environmental monitoring plan proposed in the EIA report as well as the routine environmental protection work during project construction. Its main responsibilities include:

(1) Responsible for routine environmental management work and accept supervision, inspection and guidance of environmental protection authorities of Hubei province at different level.

(2) Carry out the national environmental protection guidelines, policies, laws, regulations and technical standards and provide decision-making foundation for determining environmental policies and goals of the project; prepare project environment goals and targets and submit them for approval according to environmental guidelines;

prepare environmental management plan; guide, inspect and supervise the work of each environmental monitoring station, prepare personnel training plan, carry out internal inspection on environmental work and manage environmental protection documents, etc.

(3) Each contractor participating in the project construction shall establish environmental protection organizations or designate a person to be responsible for the environmental protection work during construction based on specific situation. In order to ensure the continuity and stability of the environmental protection work for the project, each of the aforesaid organizations and personnel shall remain relatively unchanged.

(4) Establish corresponding environmental protection system, responsible for practical and effective supervision on the implementation of environmental monitoring plan, environmental supervision plan and environmental protection measures.

(5) Responsible for leading and coordinating environmental supervision organization, each construction contractor and environmental monitoring unit.

7.1.3 Task of environmental management

(1) Construction period

Carry out relevant national environmental protection guidelines, policies as well as laws and regulations and draft up environmental protection management rules and methods during project construction. Carry out centralized management of environmental protection work in the construction area in accordance with relevant national environmental laws and regulations as well as industrial specifications. Develop yearly environmental protection work plan, sort out monitoring documents as well as establish ecological and environmental protection database for the project. Compile environmental quality report and submit it to upper level authorities as well as local environmental protection authority on a regular basis.

Enhance project environment monitoring management, examine and approve monitoring plan as well as entrust qualified organizations specialized in environment and hygiene monitoring to carry out the environment monitoring plan;

Enhance construction Environmental supervision for the project and entrust qualified supervision agency to carry out environmental supervision on the construction area and resettlement area; organize the implementation of project environmental protection plan, supervise and inspect the execution of environmental protection measures and the use of environmental protection funds, as well as ensure that the construction of each subproject can be executed according to the principle that installations for the prevention and control of pollution at a construction project must be designed, built and commissioned together with the principal part of the project; coordinate in addressing environmental pollution accident and environmental dispute arising from the project; enhance publicity and education as well as technical training of environmental protection, increase people's awareness of environmental protection and participation as well as the technical level of the project environment management personnel.

(2) Operation period

Assist local environmental protection authority in carrying out the environmental protection work in Han River basin and addressing relevant pre-construction environment problems according to the management measures of Han River basin and corresponding environmental protection management regulations. Understand the change law and impact

scope of each environmental factor and timely find out possible environmental problems relevant to the project through monitoring, and propose countermeasures and actions to carry out scientific research of environmental protection for the project.

7.2 Environmental Supervision

7.2.1 Purpose and tasks

Project construction Environmental supervision is an important part of project supervision, which shall be carried out all through the construction. The work of environmental supervision mainly aims at implementing each environmental protection measure proposed in the EIA report and minimizing the adverse impact generated by the construction activities. The environmental supervision engineer is entrusted by the PIU to focus on supervising, inspecting and managing the environmental protection work of the project contractors and specialized departments carrying out the environmental protection items during the project construction. The tasks of environmental supervision for the project construction include:

(1) Quality control

In accordance with national or local environment standards and the environmental protection clauses in the bidding document and based on the requirement of PIU, carry out field supervision and other enforcement work during project construction, and focus on how supervision contractor will perform the contract, prevent ecological damage as well as water and soil loss, protect population health, prevent and control water pollution, air pollution as well as noise pollution as required by the environmental protection clauses; and timely address environmental problems arising from the project construction.

(2) Information management

Timely understand and collect various information in the construction area as well as sort out, report, address, store and manage the information for the convenience of supervision decision making and coordination of environmental protection work of relevant participants; timely grasp the environmental condition in the project area, solve environmental dispute arising from the construction; review the monthly and quarterly report of the project contract and propose comments for inspection and modification.

(3) Organization and coordination

Assist local environmental protection authority to carry out supervision and management regarding environmental project construction quality, construction progress, reasonable use of investment and operation of environmental protection facilities, to ensure that each measure falling in place and having actual effect.

7.2.2 Scope of Environmental supervision

The environmental supervision scope of Han River Embankment Reinforcement Project includes the following aspects:

(1) Construction arrangement area

It mainly includes machine and vehicle parking and service yard, general warehouse, temporary construction area, concrete prefabrication plant, temporary living areas, stockyard and waste dump site.

(2) Construction site

It mainly includes embankment reinforcement project zone and cross-embankment structure project zone.

(3) Construction road

It mainly covers both sides of construction road.

(4) Nearby sensitive area around construction area

It mainly refers to important sensitive areas including natural protection community, scenic spot, cultural heritage and water intake facilities.

(5) Resettlement sites

It mainly refers to the rural area and towns affected by the project construction, including relocation area and resettlement area.

7.2.3 Work content of Environmental supervision

This project plans to hire 3-5 environmental supervision engineers as the scope of the Han River Embankment reinforcement project is relatively large and the project content covers a lot of points and long route. The key supervision content includes the following 7 aspects:

(1) Ecological environmental protection

Supervise the implementation of project contractors with regard to environmental protection and relevant publicity prior to constructors entering the site. Check if ecological protection warning signs of sufficient number as required in the environmental protection measures have been established in the construction area. Enhance supervision on the construction machine that cannot take soil outside the boundary during construction and eliminate the act of bird hunting by the constructors. Focus on patrolling some embankment sections and Earth Borrow Area during soil taking. Assist in developing relevant emergency plan for aquatic animal protection and assist fishery department, water conservancy department and environmental protection department in addressing relevant environmental problems. Supervise and inspect if corresponding water and soil conservation measures have been taken for temporary land occupation and construction site. Enhance pollution source control in the area to avoid aquatic ecology damage as a result of water quality pollution.

(2) Population health protection

Supervise oncomelania elimination work in the project construction area and the hygienic condition in the living quarters. Check if constructors are physically examined for infectious disease and schistosomiasis prevention before entering the site. Check if the project contractor has provided appropriate schistosomiasis prevention drugs and protective devices. Check if the health publicity of schistosomiasis and infectious disease prevention and treatment has been fallen into place prior to and during construction. Check if monitoring measures for infectious disease has been fallen into place. Ensure the water supply and drinking water safety in the project construction area, as well as supervise contractors in prevention and protection in terms of drinking water, sterilization as well as water quality monitoring.

(3) Water quality protection

Check if alkali wastewater in the project construction area is collected, treated and discharged to standards; check if oily wastewater is discharged to standards and demand that the work relevant to oily wastewater that is not provided with oil-water separator and fails to discharge to standards should be stopped. Check the temporary hygienic condition and toilet arrangement as well as the operation condition of domestic water treatment facility in the construction area and temporary living quarters. Ensure that various construction machines shall be removed from corresponding sections as soon as the construction is finished. Enhance project construction Environmental supervision and reduce disturbance of water in the drinking water protection zone as a result of disorderly construction.

(4) Atmospheric environmental protection

The supervision engineers shall require contractors and each construction contractor to cover and enclose all the materials that are easy to cause flying dust including cement, lime and garbage when transporting these materials to prevent dust pollution. Watering measures shall be taken on a regular basis for flying dust arising from road.

(5) Protection from noise

The supervision engineers shall urge project contractors to improve construction technology and to try to use low-noise equipment and process, as well as enhance service and maintenance of mechanical equipment during construction. Check if contractors have arranged the construction time frame in a reasonable way; check the arrangement of warning signs along the road. Check if contractors have carried out monitoring of sound sensitive receptors.

(6) Treatment of solid wastes

Check the handling of domestic garbage in the construction area. Supervise contractors in putting away all the equipment and surplus materials to ensure orderliness and tidiness of the site to be handed over.

(7) Protection of resettlement area

Supervise and check the drinking water safety in the Resettlement area as well as operation of drainage facilities. Check if the entire drainage system has been properly cleaned and serviced. Check if construction garbage in the Resettlement area has been cleared away. Check the drinking water quality in the Resettlement area. Ensure that all kinds of construction garbage have been well disposed at relocation.

7.2.4 Work method of environmental supervision

The field supervisors will adopt the way of patrolling and witnessing for supervision.

(1) Carry out field monitoring on water, gas and noise on the construction site on a regular basis.

(2) The environmental supervisors shall immediately notify the field representative of the contractor to correct any environmental pollution found on site. This notice will be copied to the supervision organization and the representative of the owner. Upon receiving the notice of the supervision engineer, the contractor shall rectify the problems promptly.

7.2.5 Work focus of environmental supervision

(1) The important sound and ambient air sensitive receptors involved in this project shall be thoroughly inspected based on the monitoring result. In addition, ensure that environmental protection measures have fallen into place.

(2) Adequately carry out supervision regarding water and soil conservation facilities to avoid impact on surface water environment as a result of water and soil loss and minimize impact on farmland crops. Combining various environmental protection measures proposed in the EIA, the following environmental supervision content and requirement are proposed as shown in Table 7-1 in detail.

Table 7-1 List of Major Environmental Supervision Work on Site during Construction

S.N.	Areas	Environmental supervision contents
1	Principal project construction site	<ul style="list-style-type: none"> • If construction has been carried out as per design plan and if water quality is deteriorated as a result of cofferdam construction and removal. • If construction camps are far away from residential points and provided with centralized waterless toilet, and if fecal sewage has been properly collected and treated And if sediments has been pumped out and moved out on a regular basis; if construction wastewater has been collected, treated and recycled. • If oils, lime and cement are piled up inside the embankment on both sides of the river. • If construction machine has been strictly checked for oil leak; • If constructors have been educated with environmental protection prior to construction and if orderly construction has been carried out during construction; • If various wastewater or wastes have been collected, treated and discharged to standards or moved to designated point as required by the EIA.
2	Other project construction site	<ul style="list-style-type: none"> • After the scope of land acquisition is determined, if local water resources and land resources departments as well as contractors have jointly drawn red line for construction to clarify protected objects and protected scope; • If construction time frame has been optimized to avoid peak time of wild animal activities, and if high-noise operations have been conducted in the morning, at dawn and at night; • If there is any deeds of picking wild plants or hunting wild animals; • If there is any deeds of felling, destroying vegetation outside construction area and damaging local ecology;
3	Construction camps	<ul style="list-style-type: none"> • If construction contractors have strictly executed the “Environmental Protection Education of Constructors” in the bidding document; • If wastewater from construction camps has been directly discharged into surface river, and if domestic sewage (especially fecal sewage) has been collected and treated via septic tank; • If domestic garbage from construction camps has been piled at fixed points, and if it has been disposed in a centralized way after the construction is finished.

S.N.	Areas	Environmental supervision contents
		<ul style="list-style-type: none"> • If domestic water at construction camps meets relevant water quality standards.
4	Soil borrow area and waste dump site	<ul style="list-style-type: none"> • If selection of Soil Borrow Area and waste dump site have been approved by local relevant authorities; • If selection and restoration of Soil Borrow Area and waste dump site have earnestly executed relevant comments of water resources and environmental protection; • If attention has been paid to reduce farmland occupation and vegetation damage by the contractor during soil borrowing and dumping; • If corresponding protection and prevention measures against water and soil loss have been taken for waste dumping, and if vegetation restoration or reclamation have been carried out after waste dumping is finished.
5	Centralized residential areas affected along the line	<ul style="list-style-type: none"> • If construction site has been reasonably arranged; try to be far away from residential area; • Measures such as slowing down and prohibiting sounding horn shall be taken for construction vehicles at night; • If construction time frame has been reasonably arranged, if construction is carried out at night, and if high-noise operations such as piling have been carried out at night. • If noise-tracking monitoring has been carried out according to construction progress during construction, if construction noise has been found exceed standard and generate impact on nearby residential points, and if effective noise pollution prevention and control measures have been taken in time.
6	Other matters for joint supervision(surveillance)	<ul style="list-style-type: none"> • If centralized plant mixing method has been taken at mixing station with enclosed mixing. The distance between mixing station and sensitive receptors shall not be shorter than 150m, and the station shall be set up at downwind direction of the local prevalent wind.

8 Environmental Protection Investment

8.1 Cost Composition

According to relevant regulations of Budget Preparation Specification of environmental Protection for Water Conservancy and Hydropower Project, combining the work content of environmental protection for water conservancy and hydropower project, the environmental protection investment project consists of four parts: cost of environmental monitoring measures, cost of temporary environmental protection measures, independent environmental protection cost and contingency cost.

According to the specific condition of environmental impact of this project, the environmental protection measures include environmental protection and population health protection in the Resettlement area; the environmental monitoring measures involves water quality, ecology, population health, ambient air quality and noise; temporary environmental protection measures mainly include those temporary measures for protecting construction area environment and hygiene during construction, for example, disposal of industrial wastewater and domestic sewage, noise prevention and control, disposal of domestic garbage and watering for reducing dust, hygienic practice and sterilization in construction area, as well as hygienic quarantine of constructors; the independent cost includes costs for environmental management, environmental protection final acceptance, construction Environmental supervision as well as scientific research, survey and design.

8.2 Environmental protection investment

According to the environmental impact statement, EIS of Han River Embankment Reinforcement Project (in Xiangyang) (version for approval), the total investment of environmental protection for Han River Embankment Reinforcement Project will be 8.1615 million Yuan.

Please see Table 8-1 Investment Estimates of Environmental Protection for Han River Embankment Reinforcement in detail.

Table 8-1 Investment Estimates of Environmental Protection for Han River Embankment

Reinforcement						
S.N.	Subproject cost and name	Unit	Quantity	Unit price (Yuan)	In total (10 000 Yuan)	Remark
Part I Environmental Protection Measures					418.90	
I	Ecological protection				403.90	
1	Terrestrial ecology				3.90	
(1)	Ecological Warning Board	Piece	15	1000	1.50	
(2)	Cost of ecological protection publicity and education	Year	4	6000	2.40	
2	Aquatic ecosystems				400.00	
(1)	Patrol, fish herding and				50.00	

S.N.	Subproject cost and name	Unit	Quantity	Unit price (Yuan)	In total (10 000 Yuan)	Remark
	temporary rescue during construction					
(2)	Supervision and management of construction at wetland park section				50.00	
(3)	Scientific research monitoring				80.00	
(4)	Monitoring aquatic ecosystems				70.00	
(5)	Publicity and education				5.00	
(6)	Publicity signposts				3.00	
(7)	Publicity brochure				5.00	
(8)	Emergency equipment and device				2.00	
(9)	Field equipment				5.00	
(10)	Compensation for aquatic organism resources				80.00	
(11)	Fish breeding and releasing				50.00	
II	Water quality protection				15.00	
1	Septic tank	Set	15	10000	15.00	
Part II Environmental monitoring measures					66.50	
I	Water environment during construction				33.50	
(1)	Monitoring of pollution source	Point · times	6	2500	1.50	
(2)	Surface water quality	Section · times	128	2500	32.00	
II	Ambient air quality monitoring during construction	Point · times	10	5000	5.00	
III	Noise monitoring during construction	Point · times	10	1000	1.00	
IV	Population health investigation				15.00	
1	Routine monitoring	Times	2	5000	1.00	
2	Schistosoma prevention monitoring				14.00	
(1)	Oncomelania monitoring	Year	2	30000	6.00	
(2)	Epidemic monitoring	Times	4	20000	8.00	
V	Underground water monitoring	Year	2	20000	4.00	
VI	Monitoring ecosystems				8.00	
1	Construction Period	Times	2	20000	4.00	
2	Operation period	Times	2	20000	4.00	

S.N.	Subproject cost and name	Unit	Quantity	Unit price (Yuan)	In total (10 000 Yuan)	Remark
Part III Temporary Environmental Protection Facilities					94.20	
I	Construction wastewater treatment				31.50	
1	Muddy wastewater treatment	Location	15	5000	7.50	
2	Alkali wastewater treatment	Treatment	15	8000	12.00	
3	Muddy wastewater treatment	Location	15	8000	12.00	
II	Ambient air quality monitoring				14.40	
1	Road watering	Month	24	6000	14.40	
III	Noise prevention and control				19.00	
1	Traffic Warning Board	Piece	50	800	4.00	
2	Temporary avoidance	Household	150	1000	15.00	
IV	Treatment of solid wastes				16.65	
1	Garbage disposal cost	Month	24	6000	14.40	
2	Large garbage bin	Piece	45	500	2.25	
V	Population health				12.65	
1	Protection from noise	Person	1150	10	1.15	
2	Epidemic prevention	Person	1150	100	11.50	
Subtotal from Part I to Part III					579.60	
Part IV Independent cost					162.36	
I	Construction management cost				26.08	
1	Environmental management overhead				11.59	2%, Subtotal from Part I to Part III
2	Environmental protection facility final acceptance cost				5.80	
3	Technical training cost of environmental protection and publicity				8.69	1.5%, Subtotal from Part I to Part III
II	Environmental supervision cost	Year	4	80000	32.00	
III	Scientific research, survey and design cost				104.28	
1	EIA cost				58.50	
2	Technical consulting cost				11.00	
3	Environmental protection survey and design cost				34.78	6%, Subtotal from Part I

S.N.	Subproject cost and name	Unit	Quantity	Unit price (Yuan)	In total (10 000 Yuan)	Remark
						to Part III
Subtotal from Part I to Part IV					741.96	
Contingency cost					74.20	10%, sum of part I-IV
Cost of environmental protection (not carried out yet)					816.15	

8.3 Total investment of water and soil conservation

The total investment of water and soil conservation of this project is 19.4613 million Yuan, where engineering measures account for 1.8288 million Yuan, vegetation measures 1.2872 million Yuan, temporary works 3.4194 million Yuan, independent cost 4.2263 million Yuan (165 600 Yuan for project construction supervision, 1.68 million Yuan for water and soil conservation monitoring), and water and soil conservation facility compensation 6.994 million Yuan. Please see the following table for water and soil conservation investment estimates

Table 8-2 Summary of Water and Soil Conservation Investment Estimates
Unit: 10 000 Yuan

S.N.	Project components or cost	Construction and installation Engineering	Forest and grass works		Equipment cost	Independent cost	In total
			Planting cost	Trees, grass and seeds			
	Part I Engineering measures	182.88					182.88
I	Earth Borrow Area prevention and control zone	93.75					93.75
II	Waste dump site prevention and control zone	37.77					37.77
III	Construction site prevention and control zone	16.52					16.52
IV	Construction road prevention and control zone	34.85					34.85
	Part II Vegetation measures		51.62	77.09			128.72
I	Principal project prevention and control zone		33.53	48.33			81.86
II	Earth Borrow Area prevention and control zone		10.14	13.43			23.57
III	Waste Dump Site prevention and control zone		2.30	3.05			5.35

IV	Construction site prevention and control zone		1.82	3.95			5.77
V	Construction road prevention and control zone		3.83	8.33			12.17
	Part III Temporary works	441.94					441.94
I	Temporary protection works	438.82					438.82
II	Other temporary works	3.12					3.12
	Part IV Independent cost					422.63	422.63
I	Construction management cost					15.07	15.07
II	Scientific research survey and design cost					89.05	89.05
III	Project construction supervision cost					18.50	18.50
IV	Cost of monitoring water and soil conservation					168.00	168.00
V	Water and soil conservation final acceptance cost					132.00	132.00
	Subtotal from Part I to Part IV	624.82	51.62	77.09		422.63	1176.17
	Contingency cost						70.57
	Static investment						1246.73
	Water and soil conservation compensation cost						699.40
	Total investment of water and soil conservation works						1946.13

**APPENDIX 1: CONSTRUCTION
ENVIRONMENT SPECIFICATIONS OF
CONTRACTORS**

1. General

This specification serves as instructional document and is used combining with national and local laws and regulations. It specifies the environmental management codes that construction contractors must abide by during construction of this project. The contractors and their employees shall strictly abide by the environmental protection measures specified in this specification to minimize adverse impact of construction activities on environment.

When the project is completed, prior to final acceptance, the following measures must have fallen into place:

- All the affected area shall be landscaped with grass and trees planted and vegetation shall be restored as soon as possible;
- All the river ways, drainage pipes and water channels in the affected area must be cleaned and cleared off any blockage;
- Clean all the construction sites and appropriately dispose all the remaining materials;
- Restore the soil borrow area and waste dump site.

2. Management Plan of Construction Camp

In order to solve potential adverse impact on the neighborhood that may be caused by the fact that about 500 people will be stationed during peak time for construction, the construction contractors must carry out a series of measures for the constructors and camp.

2.1 Basic requirement

Contractors shall try to recruit available local labors and provide corresponding trainings as necessary. Contractors shall consider management of human resources related thereof in an all-round way, deal with potential relationship between workers and local people and possible increasing risk of prostitution, infectious disease, theft, drugs and alcohol abuse, as well as the tensions arising from increased unemployment and different ethnic groups and cultural values as a result of temporary input to local economy and other places.

The construction camps shall abide by the following basic measures:

- Establishment of construction camps shall be approved by local relevant authorities;
- Contractors shall submit design materials covering structures, facilities and services for application two months prior to construction commencement. All the structures and infrastructure construction in the camp shall comply with relevant laws, relevant standards and environmental protection requirement and must obtain replies and permits;
- Contractors shall provide sufficient and applicable clothes washing facilities and devices for contract workers;
- Try to avoid areas covered by trees and vegetation as well as aquatic organism habitat for selecting location of construction camp and access road
- Construction camp area shall be arranged close to an environment easy for natural drainage to avoid environmental erosion;
- Contractors shall provide workers with convenient, safe and comfortable accommodation;
- Contractors shall provide sufficient hygienic facilities (toilet and washing area) for field constructors and investigators. The hygienic facilities shall be provided with sufficient clean drinking water, soap and toilet paper. Male and female washing facilities shall be separated and sufficient number shall be ensured. These facilities shall be provided with convenient access and be kept clean and hygienic any time.
- During construction and use of construction camp, the contractors shall abide by relevant environment requirements in the ESMP, effectively carry out effective sediment and erosion control measures, especially in the areas close to river;
- The contractors shall provide recreational amenities for workers in the construction camp, which will be helpful for mitigating impact on and potential conflict with local people by reducing the outgoing activities of workers;
- The contractors shall prepare safe water at the camp for preparing food, drinking and washing;

- The contractors shall install a temporary septic tank at each accommodation and carry out maintenance so that no pollution will be caused to the rivers nearby. Wastewater shall not be discharged into waters until it is treated to national standards;
- The contractors shall establish a temporary place for solid waste storage and disposal or recycled use generated from worker's camp and construction site;
- The contractors shall not use wood to heat, process or prepare any materials required by the project. Instead, other alternative fuel shall be used;
- The contractors shall ensure that the field office, warehouse and workshop shall be located at places as deemed appropriate by relevant environment engineers or supervision engineers of the PMO;
- The construction contractor shall ensure that diesel and lubricant storage area shall not be located within 100m of water source, which is for preventing pollutants from seeping into surface or underground water, especially in rainy days. A ditch shall be built around the outlet of sediment tank / oil collector that is built upon approval;
- Fences shall be used for fuel or lubricant storage area and service workshop paved with compacted/waterproof layer to prevent accidental leak of fuel and lubricant from construction site. The surface water in the fences shall be drained through designing and building oil collecting sump. Empty fuel cylinder and empty oil bucket shall be cleared off the project site. Waste lubricant shall be recycled instead of being thrown away or drained to waters nearby;
- The contractors shall ensure that the field office, warehouse and workshop shall be located at places as deemed appropriate by relevant environment engineers or supervision engineers of the PMO; These facilities shall not be established within 200m of the existing resettlement area;
- Concrete mixing station shall not be placed within 500m of residential area, residential community or factory;
- The contractors shall establish medical and first aid facilities in each camp area;
- All the medical disposals shall be placed in appropriate containers and safely treated with given procedure.

2.2 Security

The security measures shall fall in place to ensure safety and safe operation of the camp and the safety of its residents. As a minimum requirement, these security measures shall include:

- Access to worker's camps is limited to field workers, construction camp employees and work-related visitors;
- Visitors shall be required to obtain prior approval of construction camp manager before they can enter the camp.
- Sufficient lighting for daytime and night shall be provided in the worker's camp;
- Safety fence made from appropriate material with height equal to or higher than 2m shall be built around the camp;
- All the structures must be provided with firefighting equipment and portable fire extinguishers.

2.3 Maintenance of camp equipment

The following measures shall be carried out to ensure that the entire camp and its equipment can comply with relevant standards and can be assembled as well as maintained within acceptable scope:

- Camp canteen shall be designed and built strictly following hygienic and health standards.
- Draft up bylaws with regard eating schedule;
- Prohibit cooking or food preparation around accommodation area;
- Draft up bylaws with regard to work-rest schedule;
- Designate entertainment time frame within the scope of camp;
- Smoking at work place is strictly forbidden;
- Strictly execute relevant measures to keep clean and hygienic condition of construction camp and facilities;
- Toilet and urinal shall be provided with sufficient lighting as well as kept clean and hygienic all the time;
- Water tank shall be close to or located inside the toilet and urinal for the

convenience of water supply;

➤ Establish a point for receiving complaints and feedback to respond to complaints of residents in the camp regarding relevant facilities and services.

2.4 Code of conduct

A major focus during the project construction is the adverse impact on the life of residential community by the workers. out of this reason, code of conduct shall be drafted up to define appropriate behavior and eliminate drugs as well as alcohol abuse to comply with relevant laws and regulations. Once employment is established with client or contractor, each employee must strictly execute relevant code of conduct and be bound by it. Code of conduct shall be provided to the project information center of local residential community or the residential community that other citizens are easy to access to. Code of conduct shall address the following measures (but not limited to):

- All the workers and subcontractors must abide the laws and regulations of China;
- No illegal goods, weapons and guns;
- No pornographic materials and gambling;
- No fighting (physical fight and quarrel);
- No hunting, fishing or wild animals trading;
- No eating wild animals at camp;
- It is not allowed to feed pets at camp;
- Do not provoke troubles around the residential community;
- Respect local customs and tradition;
- No smoking at work place;
- Workers shall comply with relevant standards of costumes and personal hygiene;
- Construction site dormitory shall comply with relevant hygienic standards;
- Ensure that the workers keep consistency with code of conduct when entering local residential community;
- Should a worker fail to abide by code or conduct or relevant rules, bylaws and procedures developed at the camp, the worker shall be punished.

3 Construction Impact Management Plan

In order to minimize construction impact on local residential community and environment, the construction contractors of each subproject shall strictly abide by the following agreements:

3.1 Erosion and sediments

The following measures must be taken to reduce or stop water and soil loss. They measures include use of erosion control structure, vegetation protection and re-forestation and slope protection, etc. All kinds of work at project site shall be strictly managed to avoid impact of construction site erosion and sediments on downstream water way. General principles / measures include:

- Erosion and sedimentation shall be controlled during construction. The areas that are not affected by the project construction shall remain the existing status;
- Try to minimize damage of ground to keep its stability; control accumulated water and sediments in this area. Erosion control fence shall be installed beside main road passageway, disposal pit and driveway;
- For slope protection and earthwork transportation / excavation, try to minimize impact of soil surface exposure on relevant area and the sustained impact. Construction sequence shall be followed for temporary soil erosion control and slope protection project;
- Surface soil that contains dry branches and fallen leaves as well as organic matters can be reused in the areas affected by the project for promoting growth of local native plants;
- Local grass seeds shall be planted in construction areas that are already closed or in the areas of poor local soil to prevent occurrence of erosion with its root protection and covering capacity;
- Install erosion control measures prior to rainy season, preferably immediately after the project is commenced. Install erosion control measures by referring to other construction sites that already finished construction.
- Sediment control device needs to be installed in areas where runoff needs to be mitigated or redirected and in sediment trap area until vegetation is restored. Sediment

control device includes dry grass wetland, rock bank protection, sediment catchment basin, straw bag, bushes and silt fence.

- Control water flow by digging ditches, installing bank protection, inspecting device, forming liferoot barrier and rocks in the construction site or the affected area;
- Concrete or asphalt shall be used on the ground of the construction field office to minimize soil erosion;
- Erosion control measures shall be taken until vegetation is restored and grown;
- Reduce soil erosion and dust by watering muddy passageway, road, filling material and a lot of reserved sandy soil as necessary;
- Landscaping and planting shall be carried out for terrains that are greatly changed as a result of quarrying and tunnel construction, which can reduce erosion and the visual impact arising from construction as well.

3.2 Particles and dust

The contractors shall propose control methods and measures for the dust arising from construction covering quarry, crushing station and concrete mixing station, and from civil work that includes road construction, river bank and channel construction, transportation material and construction camp. The contractors shall strictly follow the following measures:

- Always minimize generation of dust and particles to avoid impact on surrounding residential community, especially vulnerable groups (children, senior citizens);
- Prevent exposure of land to wind as a result of seasonal vegetation peeling off;
- Anti-dust fence shall be built around construction site to minimize powder and dust spreading, especially pay attention to the areas around local residential community;
- Water the muddy road, passageway and areas where soil is stored or filling materials are piled up as necessary. Water at least twice a day (morning and afternoon) in dry and windy days. Appropriately increase watering frequency around the neighborhood;
- Reduce airborne dust on gravel side road near to the neighborhood and in other sensitive areas;

- Ensure that all vehicles are properly maintained and serviced. Vehicles that may cause severe air pollution or are poorly serviced shall not enter the construction site;
- During transportation of chemicals or materials, such as cement, yellow sand and lime, clean anti-seeping materials shall be completely covered to avoid leak or spill of these materials during transportation;
- Exhaust gas from construction machine and vehicles is unavoidable. However, engines shall be inspected and adjusted as the case may be to reduce air pollution.

3.3 Noise

With regard to noise reduction, the construction contractors shall:

- Limit vehicle speed on all the access roads relevant to projection construction;
- Make sure that the vehicle speed entering the site shall not exceed 30km/hour, unless otherwise specified;
- Keep the noise lower than 90Db when all the machines and equipment are running if possible;
- More strictly carry out noise reduction measures in sensitive areas to avoid disturbing local residents;
- Take appropriate measures to minimize vibration or noise as a result of construction activities;
- Develop construction material transportation schedule to reduce adverse impact on the life of surrounding residents and the traffic outside the construction site; make sure that transportation vehicles slow down and stop sounding the horn when passing sensitive areas. Minimize transportation during traffic peak. Construction contractors shall provide transportation route to the project director;
- Try to keep the optimum operating condition and lowest noise level of construction equipment;
- Use temporary sound barrier to minimize noise generated by construction equipment;

➤ Hearing protection must be provided for workers working under high-noise conditions, such as pegging, explosion, mixing and agitation. And the noise shall be controlled as well;

➤ The areas where fuel or lubricant is stored shall be installed with fence or paved with compact / waterproof ground or other surfaces to avoid accidental leak or spill of fuel and/or lubricant from fence. Surface water from fenced area shall be drained via oil skimmer or other relevant device to eliminate emission of hydrocarbon. Empty fuel/lubricant bucket, which shall be attached with MSDS label, shall not be placed at project site. And relevant trainings shall be provided to workers handling these materials;

➤ The construction supervision team shall be provided with portable noise detector to detect the noise level of sensitive receptor;

➤ Construction materials shall be moved away from the site in non-peak hours to reduce traffic flow and noise.

➤ Try to use electrical equipment instead of diesel powered or pneumatic equipment;

➤ When a noisy equipment of high intensity produces noise to one direction, make it away from sensitive receptors nearby if possible.

➤ Construction machines and equipment shall be used intermittently. They shall be shut down or slow down to the minimum speed during downtime.

Mitigating noise from construction at night

Generally speaking, there shall be no operation at night around sensitive receptors. However, some works need to be continuously operated at night probably due to technical or other reasons. If construction at night is close to local residential community, great impact will be caused on local residents and other sensitive receptors, therefore, the following special measures shall be taken during such period:

➤ The residents living in the affected area shall be notified in advance about how much time is needed for operation at night. The notice shall let the residents know the necessity of operation at night and the mitigation measures that the project will provide thereof to get their understanding. The affected residents may propose their thoughts, raise

their difficulties and suggestions. The operation at night will take appropriate comments and suggestions into consideration.

- Concrete mixer and other fixed equipment producing loud noise shall be arranged far away from residential area. Try to use municipal power supply instead of diesel power generators when operating at night to mitigate the impact caused by noise;

- Temporary sound barrier must be installed at appropriate location to avoid noise impact at night;

- The notice shall be posted at all construction sites, which shall provide project information, contact information of the person in charge of the construction site, and telephone number of environmental protection workers. Any affected person may have a channel to express their concern and suggestions.

3.4 Blasting

- The contractors shall warn the local residential community and/or residents of the upcoming noise prior to any blasting, and try to minimize the impact of such work on their life;

- More strict measures are needed in sensitive area (such as nearby residential area) to prevent adverse impact of noise;

- Blasting shall not be conducted within 200m from residential area or local residential community;

- Blasting shall not be conducted in poor weather conditions;

- Watering shall be carried out in the blasting zone prior to blasting to increase the water content. Screen mesh, gunny bag and sand bags shall be placed on top of the blasting zone to prevent environmental pollution by flying rocks and powders;

- Thorough investigation shall be carried out prior to blasting to evaluate how much impact will be caused to nearby residential community (such as damage to building structure or infrastructure as well as animals and local residents)

- Unless prior approval and authorization are obtained from the government and the PMO, no blasting shall be carried out at night.

- When blasting is ongoing, all the people shall stay more than 200m away from the blasting point;
- During the period when blasting is carried out, except for the blasting equipment, all the electrical facilities within 50m of the blasting position shall be shut down;
- The number of materials used for blasting shall be managed in a safe way and inspected every week.

3.5 Earth work, passageway and filled slope

The contractors shall ensure that construction should be conducted complying with the following work procedures:

- All the earthwork shall be appropriately controlled, especially in rainy season;
- The contractors shall keep the slope stability when filling or excavating slope and minimize disturbance to the areas outside the project scope;
- It is preferable that the contractors can operate continuously when digging and filling the last section of an area to avoid local construction of earthwork, especially in rainy season;
- In order to avoid erosion caused by excavation and filling, water interception curtain shall be installed on the top and in the bottom of slope, also drainage equipment shall be installed or grass or other vegetation shall be planted at dam toe. The water interception curtain shall be installed at a relatively high place to reduce surface runoff and slope erosion;
- Excavated earthwork or instable materials shall be disposed at a designated disposal area under the approval of supervision engineer.
- The location of the disposal area shall not be arranged at an area where there is possibility of landslide, where farmland or land of other uses may be affected, or where surface runoff may cause impact on any water source. Water channels may be dug inside and around garbage dump site. The specific construction method will be determined by the supervision engineer.

3.6 Stockyard and Soil Borrow Area

The contractors shall compile a full inventory and soil borrow area management plan

for the whole project. To open up a new soil borrow area, regardless of land, river or existing area, prior approval shall be obtained from environmental supervision organization, and the construction shall be stopped should the supervision engineer raise any doubt;

No soil borrow area arrangement in drainage area where the nature or design may be affected. The reason is that the river bank may be eroded or damaged or too many fine particles may be carried downstream of the river by such arrangement;

The location of mixer shall be approved by the supervision engineer and shall not be established in environment sensitive area or around the present residential area; also suitable dust control device shall be provided.

At the same position of a river, the depth of rock or gravel excavated shall not exceed 1/10 of the river width, and which shall not cause impact on river flow or damage the riverbed.

These plans shall include:

- A map showing the scope of the area to be developed;
- A work statement including the proposed work method;
- The egress and ingress as well as transportation route of the vehicles used for material transportation from the soil borrow area to the target area;
- Reasons for how much material needs to be taken and the detailed disposal method for subsequent waste material;
- Specific measures for minimizing visual impact on surrounding areas;
- Detailed measures for long-term ecological remediation of the soil borrow area to avoid possible health and safety threat as well as deterioration of environment.

Generally, the contractors shall:

- Clarify and divide stockyard and soil borrow area to ensure that its distance from key areas such as steep hill is at least 15m for soil easy to be eroded and drained water entering sensitive waters.
- Limit the materials to be taken and divide the soil borrow area into different zones;

➤ The surface soil of the first batch taken from the soil borrow area shall be piled and stored. When all the available materials are taken, the surface soil piled up before shall be re-scattered and backfilled smoothly and evenly to the soil borrow area, with drainage slope reserved. Steps and terrace shall be provided for areas of sharp slope to control soil erosion;

➤ The area where soil is severely damaged shall be restored and on which vegetation shall be planted again. Vegetation restoration may be promoted by covering soil surface with organic detritus when appropriate. Natural vegetation is the best.

➤ Try to reduce load on the existing main drain;

➤ Upon the completion of the project, all the remains generated by construction shall be transported and disposed at an approved disposal place.

➤ The contractors shall ensure that the excavated soil borrow area will finally be restored to a stable slope. At such time, ecological vegetation and natural water way shall have already been restored to avoid possibility of breeding mosquitoes in the excavated area as a result of accumulated water.

➤ When soil borrow area or low-lying land cannot be re-filled or drained as a result of the construction activity, the contractors shall discuss with local residential community to change such place into a pond for fish breeding or for other uses of the residential community.

3.7 Disposal of construction garbage

The contractors shall carry out the following actions:

➤ Establish and enforce daily clearing procedure, including repair and service of construction garbage disposal facilities;

➤ Try to reuse the remains generated from demolishing existing structure (for example, as filling material for embankment). The disposal site must be verified and submitted to the project construction supervision engineer for approval before the remains can be disposed. The contractors shall ensure that these disposal sites comply with the following conditions (I) they shall be located outside designated forest area; (II) they shall

not affect natural drainage; and (III) they shall not affect endangered/rare plants. Under no circumstances shall the contractors dispose materials in environment sensitive area;

➤ Should any debris or silt is settled in the area adjacent to the construction, the contractors shall immediately clear it of and restore the affected area to its original state until it is confirmed by the supervision engineer.

➤ All the traffic arrangement covering supply, maintenance, demolishing and remains removal during construction will be deemed as part of the work when necessary, and will be planned and carried out by the contractors upon approval by default, as well as designated by the supervision engineer;

➤ Consult with local residential community to see if any residential area is located near to the spoil ground, which may affect the resident's life. The consulting party shall provide detailed information of potential spoil ground to relevant owners and give them opportunity to express their comments and concerns with regard to this plan. All the information and feedback generated during construction shall be incorporated into the final design of spoil ground as part of the referential content.

➤ The design of each spoil ground must adopt the safest and the most stable technical provisions;

➤ Carry out risk assessment on the potential impact of abandoned material on surface water penetration;

➤ Carry out appropriate analysis to determine that the location selection of spoil ground will not affect surface water drainage;

➤ Avoid erosion by building safe and stable spoil ground abiding by the requirement of landscape and vegetation restoration.

3.8 Demolishing existing infrastructures

The contractors shall carry out appropriate measures to ensure that no workers or citizens will be harmed by falling debris and other falling objects from construction when demolishing the original infrastructure. For implementing these measures, the contractors shall:

- Reserve, designate and limit construction garbage disposal area, and/or install safe slide for moving waste from height to the ground;
- Appropriate protection and fixation (if applicable) shall be adopted for sawing, cutting, grinding, crushing or digging;
- Carry out transportation in a clean way by avoiding waste falling off during transportation with heavy vehicles;
- Erect temporary falling protection facilities around scaffolding and working-at-height area, such as handrails and toe plate, to prevent construction material or person falling;
- Evacuate all the workers before blasting operation, and neighboring people and structures shall be provided with anti-blasting pad or other buffering measures to minimize injury of flying rocks or ejected debris;
- Provide safety glasses, side shields, face shields, safety hat, safety boots or shoes for all the relevant workers.

4 Other Management Plans

The contractors shall be responsible for developing management plans as per relevant regulations:

4.1 Waste management plan

The contractors shall develop a waste management plan prior to project commencement in the construction period. This plan shall include:

4.1.1 Water and wastewater

- A detailed design containing review comments on the preliminary site drainage design.
- Preliminary design updates based on actual construction plan and specific field conditions (such as geographic condition, slope position and the nature of the construction project).
- Detailed design including design drawing, map, channels for drained water collection and sewage treatment facility.
- Planned discharge location and treatment standards.

- A detailed implementation plan of proposed drainage system.
- As part of the field drainage system design, the surface runoff at construction site shall be drained to avoid running soil materials off. The water shall also be treated with equipment such as sediment capture before be drained.
- Domestic sewage flowing out for field office, toilet and kitchen shall be collected by licensed waste collector or treated with licensed treatment facilities. Wastewater must be treated to the discharge limit specified by the laws of China before being discharged.
- Wastewater treatment facilities such as sedimentation tank may be installed around each construction zone that may produce wastewater. In addition, the sedimentation tanks built on site may treat the wastewater before excessive suspended solids (SS) are discharged.
- Retaining wall and sand bag isolation facility shall be built around the pile driver to prevent expansive soil and sewage entering the pile driving area. The collected expansive soil or sucked wastewater shall not be discharged without being treated.
- Prior to rainy season, all the exposed surface and slope shall be appropriately covered or landscaped to
- Minimize sand content in runoff. Slope protection can be built in an orderly way before rainy season.
- Drainage control device, such as sediment catcher, shall be installed at each drainage outlet and cleaned on a regular basis. Public toilet can be provided at each work site and at least 5 workers shall be hired for relevant work.
- At least one public toilet shall be provided for every 25 workers. Domestic sewage collected from field office and toilet shall be treated on a regular basis. Only licensed waste collector may be hired for such treatment. Sludge shall be treated as per the requirement of the waste management of the construction contractor.

4.1.2 Solid waste

The following wastes may be generated during construction:

- ✓ Remaining material that need to be disposed from earthwork transportation and slope cutting.

- ✓ Abandoned timber generated from excavation, steels from scaffolding, formwork at work site, packaging material, fuel, lubricant and paint containers.
- ✓ Wastes from original house/building damage or damage of original concrete surface as a result of the project.
- ✓ Waste from field sewage treatment facilities (such as treatment of bentonite generated from settlement of underground works), and domestic waste generated from construction camps and other facilities.
- ✓ Medical waste from field clinic.

The above wastes must be properly controlled by implementing the following measures:

- Minimize generation of wastes to be disposed or removed.
- Identify and categorize wastes. Hazardous or chemical wastes must be stored, collected, transported and disposed in an appropriate procedure.
- Determine and divide disposal area to indicate in which area should a certain material can be disposed.
- Control the location of all the construction waste (including earthwork reduction) to ensure the disposal site passes inspection (more than 300m away from river, stream, lake or wetland). Collect, recycle and treat all the garbage, metal, waste oil and remaining material from material separation and recycling system during construction in the designated areas.

The contractors shall make commitment regarding waste recycling and reuse method considering the following aspects:

- A method statement for minimizing waste recycling, reuse and generation.
- Excavated earthwork shall be used to other projects on site or nearby road or other projects to reduce materials to be treated.
- Recyclable materials such as wooden board, steel and iron, scaffolding sections and field bracket as well as packaging materials in excavation shall be separated from other wastes on site. The collected recyclable materials shall be reused to other project or sold to

waste collector for recycling, and the collected garbage shall be appropriately treated by licensed waste collector.

4.2 Pollution prevention and control plan

4.2.1 Emergency plan for hazardous substance

If it is expected or suspected that hazardous substance (chemicals, asbestos, hydrocarbon or other similar hazardous substance) will be present at construction site, the contractors will be required to prepare a hazardous substance and waste management plan (appendix 2) approved by environmental protection supervisor. At the project site, only a specially trained person can remove and dispose existing hazardous wastes as per national or provincial requirement or internationally recognized procedure.

The contractors shall:

- Provide the hazardous substance and waste management plan to all the personnel participating in operation and transportation activities;
 - Hazardous waste (chemical waste) shall be appropriately stored, treated and disposed in accordance with local laws and regulations. Hazardous wastes shall be stored at a designated place posted with warning signs;
 - Any leak accident or event shall be reported to the environmental protection supervisor or the construction supervisor;
 - Prepare an emergency plan for hazardous substance to summarize measures to be taken against the scenario of spill or accidental release;
 - Launch any remedial actions for leak or event; and
 - Provide a report to describe the reasons of leak accident or event, the adopted remedial measures, the consequence/damage of leak and the proposed rectifying actions.
- The emergency plan for hazardous substance shall be subsequently updated and submitted to the PMO, and the PMO shall have no objection to it.

4.2.2 Chemical waste

- Some chemical wastes may cause pollution to nearby habitat and water ways during construction, for example, soil pollution as a result of waste oil, waste lubricant and hydraulic oil leak, or from fuel of construction project of vehicle.

➤ The following measures must fall into place to minimize damage caused by chemical wastes:

➤ Fueling of all heavy equipment and machines shall be conducted with service vehicle to prevent any spill or pollution of chemical wastes such as service oil and lubricant;

➤ The storage of all the fuels and hazardous materials shall be fully sealed to prevent any leak;

➤ Rain water flowing out from work area, repair area and enclosed storage area shall be treated via collection and oil-gas separating pit/tank before being drained to sewer or water way.

➤ Transportation, storage and treatment of all the explosives shall follow applicable laws, good engineering design and construction practice. The contractors shall provide proposed details for storage and safety arrangement.

➤ Pesticide packaging, labeling, treatment, storage and disposal shall comply with the standards of the World Bank and the Chinese government.

4.2.3 Maintenance of construction equipment

The contractors shall:

➤ Determine and divide equipment maintenance area (more than 15m away from river, stream, lake or wetland). Fuel storage shall be established at appropriate position and approved by the PMO.

➤ Ensure that maintenance of all the equipment, including engine oil replacement, shall be operated in the designated area. Waste oil shall not be treated on the ground, in river, drain ditch or sewer system, and

➤ All the leaked and collected gasoline shall be treated as per standard environment procedure/specification. Fuel storage and gas station shall be at least 100m away from crossed drainage structure and important waters, or as directed by PMO.

4.3 Construction area cleaning

4.3.1 Cleaning of construction area

The contractors shall:

- Try to keep large or important trees and passageway in camps unchanged.
- Try to minimize chemicals used for vegetation removal. Try to be free from remaining chemicals to generate no adverse impact on human health.
- The herbicide used in project shall prove effective to target plant and have minimum impact on natural environment. It shall prove safe to residents and livestock as well as their personnel in the treatment area.
- Herbicide shall be appropriately packaged, labeled, treated, stored and disposed and completely comply with the international codes proposed by the contractor and the PMO has no objection to. The design of road, including temporary and permanent road, shall avoid possible or actual crop area.

4.3.2 Landscape, visual impact and vegetation restoration

The construction plan of the project shall be performed by stages, especially for those areas with severe or relatively high visual impact. The details of the proposed landscape and vegetation restoration measures are already contained in the soil erosion control plan.

The following measures shall be adopted as general principles:

- The construction shall be planned in an orderly way to minimize the bulldozing activity and the exposed surface area.
- Try to start vegetation restoration as soon as possible. Local plant species shall be appropriately used.
- The requirement of compensatory planting shall be contained in the design and project contract. In the design stage, a master landscaping plan and ecological monitoring or investigation requirement shall be prepared in different stages of the project. The plan shall be implemented during construction and maintained during operation.
- Facilities and structures shall be placed according to the terrain and geographic characteristics of the project site.
- The cleaned areas, for example, soil borrow pit that is no longer used, disposal area, construction road, construction camp, storage area, work platform and any temporarily used site in project construction, shall be landscaped and restored with sufficient flow and vegetation.

- Original trees and plants in the construction scope shall be labeled to indicate if such trees will be transplanted or removed. Prior to construction, address the original trees that need to be transplanted as a result of project impact.
- Excavation shall avoid damaging the root system. Mitigation measures also need to be adopted to prevent damaging tree trunks and branches.
- Temporary hoarding barrier shall show sunk visual effect whether in color or in shape.
- Upon the completion of construction, the affected area shall be restored to original state as soon as possible, including recreating natural and rocky coastal line, as well as rebuilding of sidewalk and affected vegetation.
- In areas where the vision can be highly sensitive, try to arrange tourist activities in slack season as possible.
- Try to arrange vehicles for the project to run at night, and bulk materials in transportation shall be kept clean and covered up.
- The construction site shall be enclosed with fences. If the site is located in a scenic belt, try to avoid direct visual effect of the construction site.
- Construction camps shall not be established in a scenic area.
- No disposal of solid waste in scenic area without authorization.
- Mixing station and concrete mixing shop shall not be established around a river or in a scenic area. Storage area shall be established in a invisible place to avoid tourist's line of sight.
- Try to use the original road as passageway to reduce demand on new road that may damage the original terrain and vegetation.
- Land use in agricultural activity shall be prior to construction activity. After the construction, the land shall be restored to its original state so that the agricultural activity on it can be continued.
- Corroded debris and excavated slope soil shall be reorganized and built into a stable slope with vegetation planted to prevent erosion.

➤ The surface soil peeled off from the work area shall be used for landscaping. Water ways temporarily drained as a result of construction activity shall be restored to the original flowing path.

4.3.3 Site restoration

➤ After the construction is completed, all the construction camp facilities shall be removed out of site and restored to a state similar to that prior to construction or to a state approved by local authorities and residential community.

➤ Remedial measures that cannot be effectively carried out during construction shall be implemented when the restoration work is finished (and prior to final acceptance).

➤ The activities that shall be conducted for site restoration include:

➤ Re-plant grass in construction camps. Plant saplings of the same type that was cut off.

➤ All the affected areas need landscaping. Any restoration work shall not be delayed, including grass planting and re-forestation.

➤ Debris in water ways shall be cleared off to ensure smooth flow path in drain ditch and culvert.

➤ Clear off garbage in all stations and appropriately dispose all the remaining materials.

➤ Soil borrow pit shall be restored.

➤ Soil polluted by petroleum and fuel shall be removed, transported and buried in the waste disposal area.

➤ Planted saplings shall be handed over to the community or land owner for maintenance and watering, and

➤ Seepage pit and septic tank shall be covered and effectively sealed.

4.4 Health management

Most the constructors and dependents are from different places and they may bring disease to this area. Common health problems in these groups include: sexually transmitted infection (venereal disease), HIV/AIDS, tuberculosis, respiratory tract infection, diarrhea, parasite, as well as vector-born diseases such as malaria, intemperance, taking drugs,

zoonosis, leptospirosis, and more.

The contractors need to take the following measures to ensure that sufficient project health plans can be completed.

- Screen workers during recruiting period every year;
- Execute a comprehensive vaccination plan according to the requirement of ESMP and local laws and regulations;
- Carry out anti-malaria measures under the current condition at the camp and establish early diagnosis and treatment facilities for patients;
- Store sufficient medicines for treating malaria;
- Collect and test saliva of individuals who are under the risk of tuberculosis (TB) infection;
- Store antibiotics for treating respiratory tract infection;
- Store medicines and transfusion liquid for treating food poisoning and diarrhea;
- Solutions for food poisoning that may outbreak widespread shall be ready in place;
- Public kitchen at construction camps shall be monitored on a regular basis;
- Store and distribute vermifuge to workers;
- Carry out disease control as well as pest and disease management measures during the construction of the construction camps;
- Distribute condoms to camp workers free of charge;
- Monitor health indicators following the trend;
- Mosquito net treated with pesticides such as pyrethroid shall be provided when the structures cannot effectively prevent mosquitoes.
- Appropriate measures shall be taken to carry out risk assessment and inspection on the environmental impact as a result of mosquito and insect control;
- Monitoring and identification plan must be carried out for sexually transmitted disease, especially the transmission of HIV/AIDS;

➤ Use the existing medical center at the construction camps to diagnose, and treat infectious disease before the patient is transferred to a hospital, as well as handle simple medical complaint, emergencies and accident. The medical center shall be provided with:

- ✓ 7-10 beds complete with hygienic facilities for emergency medical care to settle down emergency cases before patients are transferred to county or municipal hospital;
- ✓ Necessary medical equipment for emergency service;
- ✓ Short-term care for patients who need hospitalized treatment;
- ✓ Isolation room for patients with infectious disease (one bed) (regional and provincial facilities need to be used in case of epidemic situation);

➤ Auxiliary medical station or first-aid station with one well-trained nurse or locally trained person for small construction camps;

➤ Examine and screen construction workers for schistosomiasis before they are employed;

➤ Select appropriate workers for professional health and first-aid training additionally and form a work team consisting of two or three workers at each work site. They shall work under the supervision of medical personnel;

➤ Regulations for conducting health examination on employees shall be developed, including inspection of drug abuse and sexually transmitted disease as required by the resolutions of the International Labour Organization (ILO) and World Health Organization (WHO) (ILO code of practice on HIV/AIDS and the world of work, International Labour Office, Geneva, June 2001).

➤ Regulations shall be developed for appropriate disposal of medical wastes from clinic and other medical conducts.

4.5 Safety during construction

In case of any construction accident, the contractors shall be responsible for protecting every person and properties around. The contractors shall be responsible for abiding by safety rules of the nation or region where the project is and take any necessary measures to avoid accident, which include:

➤ The details shall take into consideration the maximum allowable vehicle speed at each road intersection;

➤ Establish safe visual distance at construction site and construction camps;

➤ Establish signs around the construction area for the convenience of traffic, provide guidance to each part of the work, as well as safety advice and warning. All the signs shall be in Chinese and made according to the specification of China;

➤ The estimated maximum traffic flow (vehicle/hour);

➤ Upon approval of the project environmental protection officer, use selected route to the project site and the size of vehicles shall be suitable to the road grade in this area. Strictly control the cargo weight to prevent damaging local roads and bridges;

➤ Responsible for damages to local roads and bridges as a result of overloaded transportation and restore the damage under the approval of environmental protection officer;

➤ Do not use any vehicles severely exceeding the standards of exhaust gas or noise. In the built-up area, the contractors shall use test equipment to make sure that noise muffler has been installed and is in good working condition;

➤ During the entire contract period, appropriate traffic regulations are necessary, which shall be approved by the project environmental protection officer in advance;

➤ Carefully and clearly mark safe passageway for pedestrians;

➤ Traffic safety man is needed to direct traffic during the time when school is open or closed if there are school children around;

➤ Ensure supply of traffic signs (including paint, easel and marking material, etc.), road marking, and handrail to maintain the safety of pedestrians during construction;

Carry out safety training to construction workers prior to construction;

✓ Provide to construction workers and enforce the use of personal protection equipment and clothes (goggles, gloves, mask, dust-proof shield, safety hat and steel-toe boots);

✓ MSDS shall be provided for each chemical substance on work site;

✓ Workers shall be required to read all the MSDS. Clearly explain the risks between

them and the partners, especially when pregnant or planning to form a family.

Encourage employees to share information with their doctors if it is appropriate;

- ✓ Ensure that materials containing asbestos or other toxic substances should be cleaned or treated by specially trained workers;
 - ✓ Suspend all the work in case of heavy rain or emergency;
 - ✓ During construction, electronic or mechanical equipment shall be secured to prevent impact of earthquake.
- Environmental protection training provided to construction workers

During construction, there is possibility of damaging protected area or water ways around the camps or construction area by workers. The contractors shall prepare an environmental protection training plan for all the construction workers: such plan shall solve the following issues:

- ✓ All the employees of contractors must abide by environmental protection specification and be able to provide evidence to prove that they have attended the training courses in the plan;
- ✓ This plan shall educate all the construction workers with regard to the following issues, but not limited to: use of guns, traffic laws, forestry products from illegal logging and collection of non-wood products, non-disturbance to resettlement residential community, restriction to hunting and fishing, waste management, erosion control, health and safety, all the prohibited activities, code of conduct and disciplinary action procedure, as well as general information about their work and living area;
- ✓ Establish punishment regulations for personnel violating rules, and
- ✓ Implement the methods recommended in the training plan, which shall include official training course, posters, information of real-time communication, as well as marks and ‘toolbox’ meeting at construction site and camps.

4.6 Residential community safety and mutual relationship

4.6.1 Traffic safety

The contractors will carry out residential community traffic and safety plan together

with local residential community and community leaders. The purpose is to minimize risks relevant to traffic during construction (see Article 5 of this appendix) The residential community traffic safety plan will include the following content:

- Provide maximum allowable vehicle speed for each road of the residential community;

- Establish safe visual distance at construction site and construction camps;

- Establish signs around the construction area for the convenience of traffic, provide guidance to each part of the work, as well as safety advice and warning.

- All the signs shall be in Chinese and made according to the specification of China;

- Upon approval of the project environmental protection officer, use selected route to the project site and the size of vehicles shall be suitable to the road grade in this area. Strictly control the cargo weight to prevent damaging local roads and bridges;

- Responsible for damages to local roads and bridges as a result of overloaded transportation and restore the damage as required;

- Do not use any vehicles severely exceeding the standards of exhaust gas or noise. In the built-up area, the contractors shall use test equipment to make sure that noise muffler has been installed and is in good working condition;

- During the entire contract period, appropriate traffic regulations are necessary;

- Carefully and clearly mark safe passageway for pedestrians;

- Traffic safety man is needed to direct traffic during the time when school is open or closed if there are school children around;

- Ensure supply of traffic signs (including paint, easel and marking material, etc.), road marking, and handrail to maintain the safety of pedestrians during construction;

- Carry out safety awareness project in local schools and residential community.

4.6.2 Blasting

- The construction contractor must ensure that no threat will be posed to local residents and residential community by blasting through carrying out the following measures (see Section 3 of this appendix).

- The contractors shall warn local residential community and/or residents that they may be disturbed by noise-producing activities; if blasting is carried out in advance, the contractor shall keep this action to minimum scope;
- In sensitive area (including residential area and school), more strict measures may need to be carried out to prevent adverse noise level;
- Blasting shall not be conducted within 200m from residential area or local residential community;
- Prior to blasting, thorough investigation shall be conducted on surrounding residential community to assess adverse impact generated probably by blasting activity (for example, potential damage to structure or infrastructure by vibration, and impact on animals and local residents, etc.)

4.7 Management plan of workers' dependents

The water conservancy project may bring opportunity of employment to local people to some degree, but will always bring a lot of external labors and dependents (such as family members, traders and merchants). The dependents are usually stationed nearby the camp. They will not only cause severe impact on local residential community (land consumption), but also generate environmental impact (for example, uncontrolled use of log as fuel, eating wild animals and water way pollution caused by inadequate waste management). Spontaneously created settlement place may also cause increasing risk of HIV/AIDS as well as other sexually transmitted disease (STI).

Also, the dependents may suffer epidemic disease such as diarrhea, respiratory tract disease, tuberculosis, food poisoning as well as traffic accident. These dependents also need houses, water and sanitary facilities as well as health service.

In order to avoid damaging surrounding areas and agricultural area and polluting nearby water ways to minimize the impact of dependents on local residential community, the PMO shall cooperate with the construction project contractor to provide other areas for the dependents outside the official construction camps.

The PMO shall prepare an dependents management plan. The following contents shall be included:

- Select appropriate location to solve the residence problem of the dependents.
- The dependents may be provided with medical service and can go to local medical organization and clinic.
- The dependents shall be provided with minimum service, such as drinking water (standpipe), public toilet, and collection and disposal of solid waste, as well as electricity, etc.
- The responsibilities that the contractors shall have on dependents shall be defined and determined by the PMO.
- Considering the relatively high uncertainty of dependents, the compilation of accompanied person plan shall be based on the actually monitored number of persons in this area as the assessment is extensively based on the number of dependents.

4.8 Environmental supervision during construction

The project engineers will be responsible for supervising execution of these specifications. Contractor failure to abide by specifications may cause project suspension or other punishment until the violations are rectified to the satisfaction of the project engineers. The contractors also must abide by national and municipal laws and regulations regarding environment, public health and safety.

**APPENDIX 2: MANAGEMENT PLAN OF
HAZARDOUS MATERIALS AND WASTES**

PURPOSE This general plan aims to outline the handling, storage and disposal of the on-site chemicals during construction.

RISK The level of expected risks depends on the type and quantity of the chemicals to be stored, the sensitivity of the on-site environment and the ability to prevent leakage.

This general plan will describe the chemicals which may need to be stored. The quantity of all kinds of chemicals stored at the site shall be limited, and the leakage of these chemicals will cause harm to the environment.

This general plan will also describe the successful operation practices of chemical storage facilities. The chemical storage facilities shall have high leak-proof ability by taking into account the chemical protection and installation of fence around the pass box. A series of measures shall be taken to minimize harm to the environment caused by spills. The most effective ways to reduce the risk of chemical spills are installation of fence around the chemical pass box and taking appropriate processing procedures.

ACTION PLAN

No.	DESCRIPTION	SUPERVISION
<i>The list of chemicals contained in this general plan</i>		
4.01	<p>The following items are considered as dangerous substances, and shall be handled and stored in accordance with the measures set forth in the this general plan. These items include new substances and residual substances and waste.</p> <ul style="list-style-type: none"> ✓ Explosive ✓ Fuel ✓ Engine oil and lubricant ✓ Hydraulic oil ✓ Paint and solvent ✓ Acid drug ✓ Coagulant and flocculant ✓ Cleaning chemical ✓ Oil in the substation ✓ Shotcrete and concrete mixture ✓ Chemical resin ✓ Bentonite and drilling fluid 	-
<i>Prevention of contamination of hazardous substances</i>		
4.02	Select the type of safe chemicals and minimize the use of chemicals.	The environmental management unit shall

No.	DESCRIPTION	SUPERVISION
	<p>To protect the environment, the chemicals stored and used in the construction site shall be selected according to the suggestions of the general successful operation practices as far as possible. Appendix 1 of this general plan lists the recognized unsafe substitutes for human and environment, and the substitutes with few hazards.</p>	<p>review the registration of the hazardous substances of the construction contractor</p>
4.03	<p>Storage of hazardous substances</p> <p>Hazardous substances shall be stored in the area with fence protection (see Appendix 2-2 Typical Storage with Fence Protection). The volume of fence shall exceed 110% of the maximum volume of single pass box within the fence. Diesel shall be stored in the tank with the maximum volume of 20,000L in the pass box. The waste oil stored in the pass box shall be stored in the tank with the maximum volume of 1,000L. The fence shall be designed and built in accordance with the guidelines for the successful operation practices. The storage area shall be provided with roof to prevent exposure to direct sunlight and rain.</p> <p>The rainwater of all areas (workshop, garage and storage area) storing or using hazardous substances shall be discharged and collected to the hydrocarbon separation tank/pit before discharge.</p> <p>In the areas with water treatment facilities, the acid drugs, coagulants and flocculants shall be stored in separate pass boxes. The surroundings shall be provided with similar fence to prevent leakage. Acid drugs shall also be stored in the ingredient area, buffer devices may be required before the sewage is discharged into the site drainage facilities and desilting basin.</p> <p>Shotcrete accelerator, chemical resin and cement grout shall be stored together and be protected from the impact of weather. The storage site shall be located within the safe area at the site where spills can be easily controlled and no water inflow incidents will occur.</p> <p>Hazardous substances of waste oils and other fluids shall be collected and disposed in a safe temporary hazardous waste disposal area, see the ESMP for details.</p>	<p>Visual inspection</p>
4.04	<p>Registration of hazardous substances</p> <p>All chemicals and waste which may be regarded as hazardous substances shall be registered to keep track of their type, inventory, use amount or generation amount. Movement from the storage point to the waste disposal site shall be registered. The registration information shall be disclosed in various hazardous material storage areas.</p> <p>The registration shall contain the following details:</p> <ul style="list-style-type: none"> i. Confirm all hazardous substances used at the site; ii. Inventory of each kind of hazardous substances at the site; iii. State (solid, liquid or gas state) of each kind of hazardous substances; 	<p>The registration status shall be provided in the monthly environmental statement</p>

No.	DESCRIPTION	SUPERVISION
	<p>iv. Hazardous properties (such as flammable, corrosive, toxic and reactive) of each kind of hazardous substances;</p> <p>v Main risks (poisoning, burning, harmful for eyes, skin and lung, and environmental pollution) caused by of each kind of hazardous substances;</p> <p>vi. The detailed emergency response procedures to be implemented on the basis of this general plan.</p> <p>The fuel allocation registration and fuel transportation record shall be retained to coordinate the use amount.</p>	
4.05	<p>Labeling of hazardous substances</p> <p>The containers of hazardous chemicals or waste shall be affixed with the labels containing the following information:</p> <p>vii. The words of "hazardous waste"</p> <p>viii. Name of the user of the construction contractor</p> <p>ix. Storage date of chemicals or the initial date of waste accumulated in the container;</p> <p>x Name of the substance and its physical state (solid or liquid state);</p> <p>xi. Hazardous properties (such as flammable, corrosive, toxic and reactive) of waste.</p> <p>Main risks (poisoning, burning, harmful for eyes, skin and lung, and environmental pollution) of the user.</p>	Visual inspection
4.06	<p>Handling safety procedures and personal protective equipment</p> <p>The handling safety procedures for hazardous substances shall be established and serve as a part of the training plan. The safety code shall be translated into English and be printed into poster to be posted on the walls of the buildings which may use hazardous substances.</p> <p>Personal protective equipment shall be provided to the relevant workers, and must be used.</p>	Visual inspection
4.07	<p>Refueling procedures</p> <p>The fuel shall be stored in the steel tank in the safe area, be provided and maintained by the fuel supplier. The area storing the fuel and diesel shall be provided with large enough protective wall (more than 110% of the volume) to mitigate leakage or overflow of these substances. The discharged water and oil/petroleum shall be collected in the oil pit before the rainwater is discharged into the drainage facilities and desilting basin at the site.</p> <p>Oil tank and fuel tank trucks shall be equipped with screw connecting device. Oil tank trucks shall be equipped with automatic shut-off valve to prevent excess filling. Refueling of heavy equipment and machinery shall be performed by special service vehicles.</p> <p>Oil tanks shall be protected to prevent accidental displacement due to the vehicle at the site or</p>	Visual inspection

No.	DESCRIPTION	SUPERVISION
	<p>natural causes.</p> <p>Anti-spill prevention measures shall be taken for the special service vehicles which refuel the machinery outside the service area, including placement of oil drum drip tray under the nozzle.</p> <p>The oil tank truck drivers shall have the awareness of being alert to prevent harm to environment. It is included in the training plan.</p> <p>The safety procedures on fire and accidental leakage management shall be affixed at the site. The areas handling or storing fuels shall be affixed with the no smoking signs.</p>	
4.08	<p>Emergency kit for leakage</p> <p>The emergency kit for leakage shall be used to control the leakage onto the ground which may be caused by maintenance or other reasons. The emergency kit for leakage shall be placed in the maintenance workshop and refueling points.</p> <p>All workers related to refueling or equipment maintenance shall be familiar with the use of the emergency kit for leakage, and receive the training on the emergency procedures defined in Appendix 5--Contingency Plan for Hazardous Substances.</p>	<p>Visual inspection</p> <p>Review the registration form of training participation</p>
4.09	<p>Leakage contingency procedures</p>	-
4.10	<p>Leakage prevention of generator</p> <p>All generators shall be placed in a permanent fence area (refer to 5.03), or, in case of temporary operation, be placed inside the metal drip pan with the size and side height being in line with the requirements for hazardous substances fence storage (the size is 110% of the volume of the chassis of the generator).</p>	<p>Visual inspection</p>
4.11	<p>Precautions for use and storage of alpha-Cypermethrin during the process of cleanup of reservoir bottom:</p> <ul style="list-style-type: none"> xii. The agents shall be stored in a cool and dry place and be out of reach of children. xiii. Gloves shall worn during use, and do not let the liquid contact the skin and eyes. xiv. Due attention shall be paid to the use amount, with particular attention to evade staff in case of indoor use, especially for the people prone to allergies, and sufficient ventilation shall be provided to indoors after use to avoid human discomfort. 	

APPENDIX 2-1

LIST OF SUBSTANCES BANNED OR RESTRICTED TO BE USED AT THE CONSTRUCTION SITE

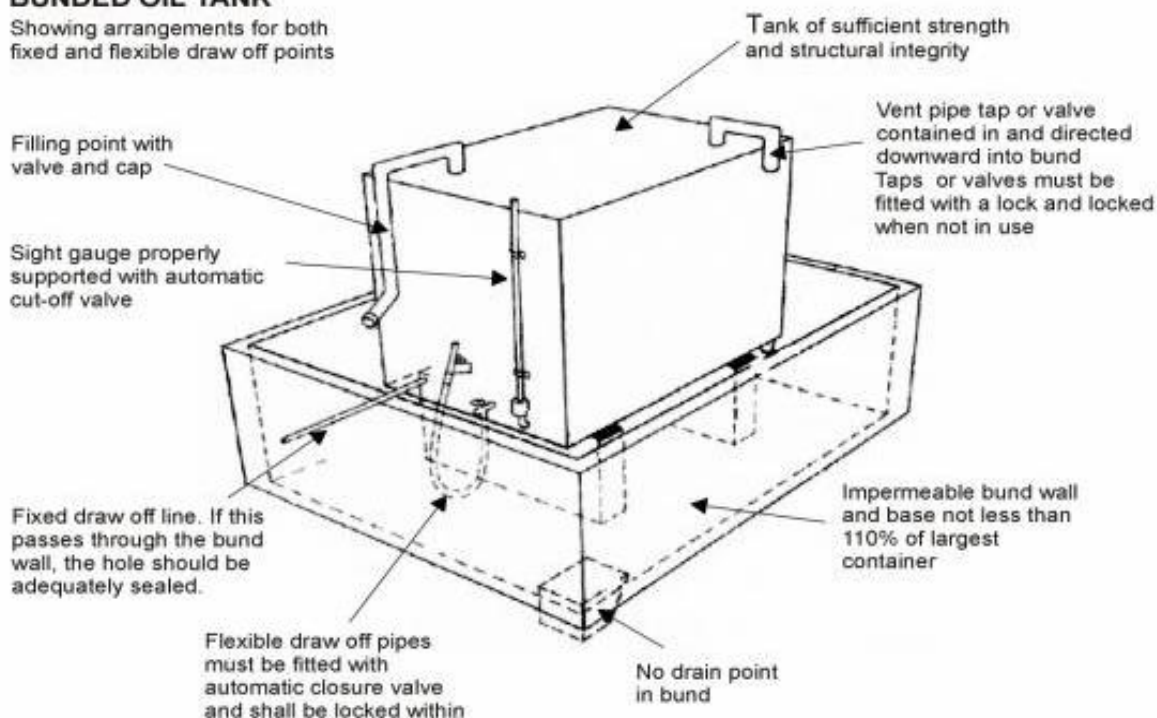
THE SUBSTANCES BANNED OR RESTRICTED TO BE USED	REASON FOR RESTRICTION	SUBSTITUTE SUBSTANCE
Polychlorinated biphenyls (PCBs)	Carcinogens and toxic substances can be accumulated in the body.	Organic silicon, lipids and casting resins.
Friable asbestos	Inhaling of fibers can damage the lungs. It is classified as hazardous substances by the World Bank and shall be prohibited to be used.	There are stable substitutes for insulation and roof. There are no better substitutes for brakes of the truck.
Pentachlorophenol (PCP) and formaldehyde (pesticides)	Carcinogens and ecological toxins. The waste products may be defined as hazardous waste by the World Bank.	Glutaraldehyde and isothiazoline (or other low-toxicity pesticides).
Lead-containing paint	With low toxicity, and the toxic substances can be accumulated in the body. The waste products may be defined as hazardous waste by the World Bank.	Lead-free paint. In addition, water-based paints or low-volatile solvent formulations can reduce the potential impact of paint on health.
Chlorinated solvents (such as carbon tetrachloride and trichlorethylene)	It may be toxic (depending on what kind of compounds).	Chlorinated hydrocarbons-free solvents and steam cleaning.
Heavy metal (reverse demulsifier)	Various reverse effects. The waste products may be defined as hazardous waste by the World Bank.	Polymer formulations (non-latex)
Mercury (in the pressure measuring devices and instruments)	With neurotoxic effects. The waste products may be defined as hazardous waste by the World Bank.	Differential pressure unit/transmitter, pneumatic or electric instruments.
Lead-containing naphthenate (lubricant)	With neurotoxic effects. The waste products may be defined as hazardous waste by the World Bank.	Lead-free lubricant.
Lead-containing thread oil	With low toxicity, and the toxic substances can be accumulated in the body. The waste products may be defined as hazardous waste by the World Bank.	Lead-free thread oil, such as Bestolife 2000 (pipes and casings).
Chromate inhibitor	The chromium in hexavalent form is toxic to humans and animals.	Sulfites or organic phosphorus inhibitors, especially those with the effect of reducing toxic amines.

APPENDIX 2-2

TYPICAL FENCE STORAGE OF HAZARDOUS SUBSTANCES

BUNDED OIL TANK

Showing arrangements for both fixed and flexible draw off points



Banded oil tank	围堤油罐
Showing arrangements for both fixed and flexible draw off points	说明固定式和灵活式泄水点设计
Filling point with valve and cap	带阀门和阀盖的灌注点
Sight gauge properly supported with automatic cut-off valve	用自动截止阀恰当支撑的观测计
Fixed draw off line. If this passes through the bund wall, the hole shall be adequately sealed	固定式泄水管。如果通过围堤，应将孔洞恰当密封。
Flexible draw off pipes must be fitted with automatic closure valve and shall be locked within	灵活式泄水管必须配备自动关闭阀并在里面锁紧
Tank of sufficient strength and structural integrity	有足够强度和结构完整性的油罐
Vent pipe tap or valve contained in and directed downward into bund	内含风管龙头或阀门并向下导入围堤内
Taps or valves must be fitted with a lock and locked when not in use	龙头或阀门必须配锁，在不用时锁上
Impermeable bund wall and base not less than 110% of largest container	防渗围堤和基座不低于最大箱罐的110%
No drain point in bund	围堤内无排水点

APPENDIX 2-3

LABEL SAMPLES OF CONTAINER OF HAZARDOUS SUBSTANCES

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBIT IMPROPER DISPOSAL.
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY
AUTHORITY, THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL.

GENERATOR INFORMATION:

NAME UNIVERSITY OF CALIFORNIA, BERKELEY

ADDRESS UNIVERSITY HALL 3RD FLOOR PHONE 642-3073

CITY BERKELEY STATE CA ZIP 94720-1150

EPA / MANIFEST ID NO. / DOCUMENT NO. _____

EPA WASTE NO. 0008 CA WASTE NO. 81 ACCUMULATION START DATE _____

CONTENTS, COMPOSITION: LEAD BATTERY PRINT CHIPS

INITIAL STATE DATE 1-01-01

PHYSICAL STATE: _____ HAZARDOUS PROPERTIES: FLAMMABLE TOXIC
 SOLID LIQUID CORROSIVE REACTIVITY OTHER _____

D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX

HANDLE WITH CARE!

STYLE CFWMCA6R

LABELMASTER® (800) 621-5808 www.labelmaster.com

HAZARDOUS WASTE CONTAINER LABEL

HAZARDOUS WASTE	危险废物
STATE AND FEDERAL LAW PROHIBIT IMPROPER DISPOSAL.	州和联邦法律禁止处理不当
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY. THE U.S. ENVIRONMENTAL PROTECTION AGENCY OR THE CALIFORNIA DEPARTMENT OF	如发现本物质, 请联系最近的警察或公共安全部门、美国环境或加利福利

TOXIC SUBSTANCES CONTROL.	亚毒害物质控制部门
GENERATOR INFORMATION	物质制造人信息
NAME	名称
ADDRESS	地址
PHONE	电话
CITY	城市
ZIP	邮编
EPA ID NO. / MANIFEST DOCUMENT NO.	环保局编号/文件号
EPA WASTE NO.	环保局废物编号
CA WASTE NO.	加州废物编号
ACCUMMULATION START STATE	收集开始日
CONTENTS, COMPOSITION	成分、组分
PHYSICAL STATE	物理状态
HAZARDOUS PROPERTIES	危害性质
FLAMMABLE	易燃
TOXIC	有毒
SOLID	固体
LIQUID	液体
CORROSIVE	腐蚀性
REACTIVITY	反应性
OTHER	其他
D.O.P. PROPER SHIPPING NAME AND UN OR NO. WITH PREFIX	交通部正确危险品学名及联合国编码或无前缀编码
HANDLE WITH CARE!	小心轻放!
HAZARDOUS WASTE CONTAINER LABEL	危害废物容器标示