Environmental Monitoring Report

Project Number: 45507-003
May 2017

PRC: Yunnan Chuxiong Urban Environment Improvement Project – Environmental Monitoring Report (July – December 2016)

Prepared by Chuxiong Prefecture Project Management Office with the assistance of China Urban Construction Design & Research Institute Co., Ltd. for the Chuxiong Prefecture Government and the Asian Development Bank.

Asian Development Bank

Table of Contents

1.0 ABBREVIATION

ADB	- Asian Development Bank
CDIC	- Chuxiong Development and Investment Company Limited
CPEMS	- Chuxiong Prefecture Environmental Monitoring Station
CPG	- Chuxiong Prefecture Government
CPPMO	- Chuxiong Prefecture Project Management Office
CPPLG	- Chuxiong Prefecture Project Leading Group
CSC	- Construction Supervision Company
CUCD	- China Urban Construction Design & Research Institute Co., Ltd
DRC	- Development and Reform Commission
EA	- Executive Agency
EEM	- External Environment Monitor
EMP	- Environmental Monitoring Plan
EMU	- Environmental Management Unit
EMR	- Environmental Monitoring Report
EIA	- Environmental Impact Assessment
EMS	- Environmental Monitoring Station
EPB	- Environmental Protection Bureau
FB	- Bureau of Finance
FSR	- Feasibility Study Report
GRM	- Grievance Redress Mechanism
IA	- Implementation Agency
LIEC	- Loan Implementation Environmental Consultant
LPMO	- Local Project Management Office
LPLG	- Local Project Leading Groups
LRB	- Land and Resources Bureau
LUCIC	- Lufeng Urban Construction and Investment Company
PB	- Planning Board
PCCU	- Project Complaints Coordinating Unit
PIC	- Project Implementation Consultant services
PIU	- Project Implementation Unit

PPTA	- Project Preparatory Technical Assistance
PPCU	- Project Public Complaints Unit
WUCIC	- Wuding Urban Construction and Investment Company
YPG	- Yunnan Provincial Government

2.0 INTRODUCTION

2.1 Report Purpose and Rationale

1. As required by the EIA for the Chuxiong Urban Environmental Improvement Project and the original EMP prepared under ADB project TA-7981-PRC, the borrower is required to prepare semi-annual EMRs for submission to the Chuxiong Prefecture Government and the ADB. This report is prepared by the Chuxiong Prefecture Project Management Office (CPPMO), with assistance from the LIEC, China Urban Construction Design & Research Institute Co., Ltd (CUCD). Environmental monitoring reports (EMRs) are required in order to evaluate and assess overall project activities to ensure the effective implementation of the environmental management plan (EMP).

2. The purpose of this Environmental Monitoring Report (EMR) is to document environmental management activities undertaken and environmental impacts as a result of project implementation, as well as identifying issues and suggesting corrective actions. This environmental monitoring report is the third semi-annual EMR, covering the period from July to December 2016.

3. This semi-annual EMR is intended to not only cover the construction phase, but also demonstrate compliance with the EMP for the design, bidding, construction preparation stages and physical construction phase. In line with targets aimed at reducing any negative environmental impacts of the Project, and in accordance with relevant specifications and standards of the PRC, and policies of the Asian Development Bank (ADB), this report emphasizes the following areas: (i) progress made in implementing the EMP, (ii) implementation of mitigation measures, (iii) environmental monitoring and compliance, (iv) institutional strengthening and training,(v) public consultation, and (vi) problems that have occurred and corrective actions taken.

2.2 Project Objective and Components

4. As the second and third tie level cities, the project cities of Chuxiong, Wuding and Lufeng face urban development challenges including high flood risks, poor urban living environment, inadequate urban infrastructure, low quality of municipal services, and lack of institutional capacity. Further assistance is needed to stimulate economic growth in these cities.

5. The Project aims at promoting balanced and environmentally sustainable urbanization and environmental improvement, as well as improving living conditions in these project cities. The Project will support (i) flood controls and environmentally friendly river rehabilitations; (ii) environmental and sustainable urban infrastructure development; (iii) city and town environmental health improvement; and, (iv) capacity development. The proposed project will promote local economic development and improve the urban living condition, improving municipal services and infrastructures, improving urban environmental health and urban transport systems.

6. Project components include the development of Integrated Municipal and Environmental Services in each of the three Project cities – Chuxiong, Wuding and Lufeng, as well as support for the strengthening of management capacity and financial sustainability.

7. Component #1 – Chuxiong Urban Infrastructure and Environment Improvement:

   A. 9.4 kilometers (km) of Longchuan River flood protection and enhancement with improved 6.2-km river embankments, 202,505 m^2 landscaping, and installation of flood early warning system including a coordination center, 2 water/rainfall monitoring stations, 19 real-time monitoring cameras, and 4 flood warning broadcasting stations;

   B. 9.0-km urban roads with non-motorized traffic lanes, pedestrian and bicycle facilities;

   C. 19.0-km of water supply pipeline, 18.8-km of sewerage pipeline with 29 sewage interceptor facilities, 19.2-km of storm water pipeline, 9.0-km power supply, telecommunication cable networks and 2 street light maintenance vehicles;

   D. Installation of an integrated traffic control and traffic management system comprising traffic signal with traffic control system and monitoring camera; and

   E. 8 compaction type waste collection vehicles, 14 waste collection vehicles, 2,500 trash bins, 2,900 waste containers, 1 recycling machine for construction and demolition waste, 6 street sweeping vehicles, 2 high pressure street cleaning vehicles, 2 water spraying vehicles, 4 sewage collection vehicles, and 10 portable toilets.

8. Component #2 – Lufeng Urban Infrastructure and Environment Improvement:

   A. 2.0-km East and 4.1-km West river enhancement and flood protection with 12.2-km of river embankment protection, 290,336 m^2 of landscaping and installation of flood early warning system including a coordination center, 3 water/rainfall monitoring stations, 10 real-time monitoring cameras, and 3 flood warning stations;

   B. A storm water detention pond system with volume capacity of 68,135 m3;

   C. 7.5-km urban roads with non-motorized traffic lanes, pedestrian and bicycle facilities;

   D. 15.9-km of water supply pipeline, 15.5-km of sewer pipeline with 4 sewage interceptor facilities, 18.6 km of storm water pipeline, 7.5-km of power and telecommunication cable networks; and

   E. 4 compaction-type waste collection vehicles, 10 waste collection vehicles, 1 construction and demolition waste recycling machine, 10 street sweeping/dust collection vehicles, 1 high pressure street cleaning vehicles, 2 water spraying vehicle, and 2 sewage collection vehicles.

9. Component #3 – Wuding Urban Infrastructure and Environment Improvement:

   A. 2.6-km of Wulong River flood protection and enhancement through 5.2 km of river embankment protection, 54,572 m^2 of landscaping and installation of the flood early warning system including a coordination center, 7 water/rainfall monitoring stations, 10 real-time monitoring cameras, and 3 flood warning broadcasting stations;

B. A storm water detention pond with volume capacity of 16,884 m^3;

C. 9.4-km urban roads with non-motorized traffic lanes, pedestrian and bicycle facilities, and 1 street light maintenance vehicle;

D. 17.9-km of water supply pipeline, 13.4-km of sewer pipeline with 10 sewage interceptor facilities, 20.3-km of storm water pipeline, 9.4-km of power and telecommunication cables networks; and

E. 3 compaction type waste collection trucks, 4 mini waste collection & transport vehicles, and 1 street sweeping/dust collection vehicle, 1 movable toilet, and 198 waste containers.

10. Component #4 – Capacity Development and Institutional Strengthening:

A. Capacity building and institutional strengthening for the Project management;

B. Expert support and advice on storm water management, municipal solid waste planning and management, urban transport management, and road safety; and

C. Public awareness activities including road safety and solid waste recycling; and training, seminars, workshops, and study tours on operation and maintenance, public financial management, and public participation and awareness raising activities.

2.3 Project Implementation Progress

11. Project components include civil works in one city (Chuxiong) and two counties (Wuding and Lufeng) in the Province of Yunnan. Since the engagement of the CUCD as the LIEC, The CUCD has mobilized its project team early in 2014. International and national experts of the CUCD have conducted field visits and carried out detailed project assessment and a series of training and capacity development activities to all relevant agencies for EMP implementation.

12. Status of Contractor Engagement and Project Progress has been summarized in the following tables.

Chuxiong City Urban Infrastructure & Environment Improvement Works

Status of Contractor Engagement

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Name of Contractor	Date of Contract signed	Name of EMS	Name of CSC
Chuxiong Development and Investment Company Limited (CDIC)	CCX1	1、 Scope: 2958.165M urban road of No.11, with 40M red line width and 40KM/h speed. 2、 Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities	Xinzhou Proprietary Corporation	20th ,November, 2016	CPEMS	Kunming Construction Consulting & Supervising Co. Ltd

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Name of Contractor	Date of Contract signed	Name of EMS	Name of CSC
	CCX2&CCX3	1、Scope: 1397.89M urban road of No.10, with 36M red line width and 30KM/h speed; 1612.056M urban road of No.49, with 24M red line width and 20KM/h speed. 2、Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities.				
	CCX4	1、Scope: 1485M 1st urban road of No.17, with 60M red line width and 60KM/h speed. 2、Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities.	China Railway Shanghai Engineering Bureau Corporation	27th, November, 2015	CPEMS	Kunming Construction Consulting & Supervising Co. Ltd
	CCX5	1、Scope: 1471.165M 2nd urban road of No.17, with 60M red line width and 60KM/h speed. 2、Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities.				
	CCXR1	1、Scope: 9385M of Longchuan River flood protection and enhancement. 2、Content: Flood control channel design standards in a 10-year return; ecological management taken including emergent plants planting along embankment, urban green landscaping, recreation space, water and soil conversation, flood early warning system, and environmental				Yunnan Rundian Project Technology Consulting Co. Ltd

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Name of Contractor	Date of Contract signed	Name of EMS	Name of CSC
		improvement.				
	CCXR2	1、 Scope: 202505M^2 landscaping 2、 Content: urban green landscaping, recreation space, and environmental improvement.				

Chuxiong City Urban Infrastructure & Environment Improvement Works

Status of Project Progress

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
Chuxiong Development and Investment Company Limited (CDIC)	CCX1	1、 Scope: 2958.165m urban road of No.11, with 40M red line width and 40KM/h speed. 2、 Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities	The contractor mobilized on 1st December, 2016. Road cleaning and roadbed smoothing started on 15th, December. Total excavation to date is 30,000 m^3.
	CCX2&CCX3	1、 Scope: 1397.89M urban road of No.10, with 36M red line width and 30KM/h speed; 1612.056M urban road of No.49, with 24M red line width and 20KM/h speed. 2、 Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities.	Preparing the bidding documents.
	CCX4	1、 Scope: 1485m 1st urban road of No.17, with 60m red line width and 60KM/h speed. 2、 Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor,	The contractor mobilized on November 30th, 2015. Total excavation to 25th June, 2016 is 69,740 m^3. Amount of earth filled for road based is 310,889 m^3. Amount of water pumped is 38,000m^3. Amount of sludge pumped is 32,000m^3. Equipment mobilized includes

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
		telecommunication cable networks and street light maintenance vehicles facilities.。	excavator, loader, bulldozer, water pump and dump trucks. In coordination with the Underground Comprehensive Pipe Gallery Construction, the construction of CCX4 was in shutdown period from 25th June, 2016 to 31th December, 2016. It will restart in March, 2017.
	CCX5	1、Scope: 1471.165m 2nd urban road of No.17, with 60M red line width and 60KM/h speed. 2、Content: urban road, an integrated traffic control and traffic management system, water supply, sewerage and storm water pipelines, sewage interceptor, telecommunication cable networks and street light maintenance vehicles facilities.。	The content of CCX5 is in the processing of adjustment for the resettlement of villages involved by CCX5 can't come to an agreement.
	CCXR1	1、Scope: 9385M of Longchuan River flood protection and enhancement. 2、Content: Flood control channel design standards in a 10-year return; ecological management taken including emergent plants planting along embankment, urban green landscaping, recreation space, water and soil conversation, flood early warning system, and environmental improvement.	Bidding of CCXR1 has been done. Now it is in the processing of contract negotiation.
	CCXR2	1、Scope: 202505M^2 landscaping 2、Content: urban green landscaping, recreation space, and environmental improvement.	Preparing the bidding documents.

Wuding County Urban Infrastructure & Environment Improvement Works

Status of Contractor Engagement

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Contractor Name	Date of Contract signed	Name of EMS	Name of CSC
Wuding Urban Construction and Investment Company (WUCIC)	CWD1	1、Scope: Beichengdadao Road 2、Content: 1558.968M urban road of Beichengdadao Road, with 40M red line width.	Beijing Urban Construction Road & Bridge Co. Ltd.	24th,September, 2015	CPEMS	Kunming Construction Consulting & Supervising Co. Ltd
	CWD2	1、Scope: Wuxu Road and Wuchan Road 2、Content: 848.305M urban road of Wuxu Road with 20M red line width; 1346.228M urban road of Wuchan Road with 20M red line width.	Beijing Urban Construction Road & Bridge Co. Ltd.	25th April, 2016		
	CWD3	1、Scope: Chengbei Raod and bypass 2、Content: 1267.981M urban road of Chengbei Road, with 32M red line width; 338.182M bypass roads (NO1 and NO2) with 15M red line width.	Beijing Xinchang Road & Bridge Co.Ltd.	22nd April, 2016		
	CWD4-1	1、Scope: Wuzheng Road 2、Content: 924.023M urban road of Wuzheng Road, with 20M red line width.	Yunnan Zhenghao Construction Engineering Co Ltd.	28th,August, 2015		
	CWD4-2	1、Scope: Mudan Road, Caiyuan Road, Binghe Road 2、Content: 1318.92M urban road of Mudan Road, with 30M red line width; 606.631M urban road of Caiyuan Road, with 24M red line width; 1183.468M urban road of Binghe Road, with 20M red line width.	Yunnan Zhenghao Construction Engineering Co Ltd.	29th October, 2016		
	CWD5	1、Scope: a storm water detention 2、Content: a storm water detention with volume capacity of 16884 m^3.				
	CWDR1	1、Scope: Wulong River 2、Content: 2.6KM of Wulong River flood protection and enhancement through 5.2km of river embankment protection, and 54572m^2 of landscaping.				

Wuding County Urban Infrastructure & Environment Improvement Works

Status of Project Progress

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
Wuding Urban Construction and Investment Company (WUCIC)	CWD1	1、 Scope: Beichengdadao Road 2、 Content: 1558.968M urban road of Beichengdadao Road, with 40M red line width.	The contractor mobilized on December 8th, 2015. To date, construction on inspection well, sewerage and storm water pipeline has been implemented. 90% of Roadbed construction and electric tunnel construction has been implemented. 5 box girders have been installed for No. 4 bridge crossing Wulong River.
	CWD2	1、 Scope: Wuxu Road and Wuchan Road 2、 Content: 848.305M urban road of Wuxu Road with 20M red line width; 1346.228M urban road of Wuchan Road with 20M red line width	The contractor mobilized in October. To date, construction on inspection well, sewerage and storm water pipeline from K0+400 to K1+320 has been implemented.
	CWD3	1、 Scope: Chengbei Raod and bypass 2、 Content: 1267.981M urban road of Chengbei Road, with 32M red line width; 338.182M bypass roads (NO1 and NO2) with 15M red line width.	The contractor mobilized in October. To date, construction on sewerage water pipeline from K0+520 to K1+303, storm water pipeline from K0+520 to K0+820, and roadbed from K0+520 to K1+303 has been implemented.
	CWD4-1	1、 Scope: Wuzheng Road 2、 Content: 924.023M urban road of Wuzheng Road, with 20M red line width.	The contractor mobilized on October 20th, 2015. To 30th June, 2016, construction on road cleaning and roadbed smoothing, on storm and sewerage water pipeline from K0+270 to K0+330, and from K0+560 to K0+892 has been implemented. The project was in shutdown period from July to September for the resettlement issues. The contractor remobilized on 18th October, 2016. To date, construction on road cleaning from K0+380 to K0+600, on roadbed smoothing from K0+027.203 to K0+436.594, on roadbed setting and electric engineering from K0+516.312 to K0+892.276, on sewerage water pipeline from W-13 to W-20, on storm water pipeline from SY-13 to SY-20 and from NY-13 to NY- 20 has been implemented.
	CWD4-2	1、 Scope: Mudan Road, Caiyuan Road, Binghe Road 2、 Content: 1318.92M urban road of Mudan Road, with 30M red line width; 606.631M urban road of Caiyuan Road, with 24M red line width; 1183.468M urban road of Binghe Road, with 20M red line	The contractor mobilized in November, 2016. To date, construction on road cleaning and repetition measurement from K0+069.5 to K0+186.274, on roadbed, sewerage water pipeline and inspection well from K0+360 to K0+840 has been implemented.

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
		width.	
	CWD5	1、 Scope: a storm water detention 2、 Content: a storm water detention with volume capacity of 16884 m3	The bidding documents has been issued on 16th December, 2016, and the bid winner has not yet determined.
	CWDR1	1、 Scope: Wulong River 2、 Content: 2.6KM of Wulong River flood protection and enhancement through 5.2km of river embankment protection, and 54572m2 of landscaping.	The bidding documents has been issued on 16th December, 2016, and the bid winner has not yet determined.

Lufeng County Urban Infrastructure & Environment Improvement Works

Status of Contractor Engagement

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Name of Contractor	Date of Contract signed	Name of EMS	Name of CSC
Lufeng Urban Construction and Investment Company (LUCIC)	CLF1	1、 Scope: Zhuluojidadao Northern extension line 2、 Content: 1000.933M urban road of Zhuluojidadao Northern extension line, with 40M red line width.			CPEMS	Yunnan Urban Construction Consulting & Supervising Co. Ltd
	CLF2	1、 Scope: No.1 road and Jinshan South Road 2、 Content: 1587.129M urban road of No.1, with 36M red line width; 1657.595M urban road of Jinshan South Road with 36M red line width.				
	CLF3	1、 Scope: Century Dadao extension line 2、 Content: 1000.933M urban road of Century Dadao Extension line, with 36M red line width.				
	CLF4	1、 Scope: No 2 Road and No 3 Road 2、 Content: 1409.542M urban road of No.2, with 24M red line width; 1000.55M urban road of No 3, with 32M red line width.				
	CLF5	1、 Scope: a storm water	Guangdong	14th		

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Name of Contractor	Date of Contract signed	Name of EMS	Name of CSC
		detention pond 2、Content: a storm water detention pond system with volume capacity of 68135m^3.	Dayu Water Resource Construction Co.Ltd	October, 2016		
	CLFR1	1、Scope: East and West River enhancement 2、Content: 2.0KM East and 4.1KM River enhancement and flood protection				
	CLFR2	1、Scope: river embankment protection and landscaping 2、Content: 12.2km of river embankment protection, and 290,336 m2 of landscaping.				

Lufeng County Urban Infrastructure & Environment Improvement Works

Status of Project Progress

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
Lufeng Urban Construction and Investment Company (LUCIC)	CLF1	1、Scope: Zhuluojidadao Northern extension line 2、Content: 1000.933M urban road of Zhuluojidadao Northern extension line, with 40M red line width.	The bidding document has been issued on 2nd December, 2016. The contract has not signed.
	CLF2	1、Scope: No.1 road and Jinshan South Road 2、Content: 1587.129M urban road of No.1, with 36M red line width; 1657.595M urban road of Jinshan South Road with 36M red line width.	Preparing the bidding documents and land resettlement is going-on.
	CLF3	1、Scope: Century Dadao extension line 2、Content: 1000.933M urban road of Century Dadao Extension line, with 36M red line width.	Preparing the bidding documents and land resettlement is going-on.
	CLF4	1、Scope: No 2 Road and No 3 Road 2、Content: 1409.542M urban road of No.2, with 24M red line width; 1000.55M urban road of No 3, with 32M red line width.	Preparing the bidding documents and land resettlement is going-on.
	CLF5	1、Scope: a storm water detention pond 2、Content: a storm water detention pond system with volume capacity of	Preparing the bidding documents and land resettlement is going-on.

Name of PIU	Civil works contract/ procurement	Nature of Civil works	Status of Project Progress
		68135m3.	
	CLFR1	1、Scope: East and West River enhancement 2、Content: 2.0KM East and 4.1KM River enhancement and flood protection	The contractor mobilized on 1st November, 2016. To date, construction on road cleaning on the right side of the river from K1+575 to K1+916, from K1+200 to K1+540, from K0+300 to K1+800 has been implemented. Amount of excavation was 24,200m^3. Construction on river trench excavation and stone replacement from K1+600 to K1+880, on foundation concrete from K1+620 to K1+280, on anti-erosive stone installing from K1+280 to K1+550 has been implemented. Construction on river trench excavation and stone replacement in the left side of the river from K0+400 to K0+780 has been implemented.
	CLFR2	1、Scope: river embankment protection and landscaping 2、Content: 12.2km of river embankment protection, and 290,336 m2 of landscaping	Bidding document is ready. Now it is in the recording process.

3.0 INSTITUTIONAL SETUP AND RESPONSIBILITIES FOR EMP IMPLEMENTATION AND SUPERVISION

3.1 Institutional Responsibilities for Environmental Management

13. The Chuxiong Yi Minority Autonomous Prefecture Government (CPG) is the Executive Agency (EA) of the project. The EA is responsible for communication with ADB, loan repayment, as well as supervision and guidance of the CPPMO, LPMOs and the Project Implementation Units (PIUs) for project implementation in three project city/counties. At the Prefecture level, CPG has established (i) the Chuxiong Prefecture Project Leading Group (CPPLG) to provide policy guidance and coordination, and (ii) Chuxiong Prefecture Project Management Office (CPPMO) to supervise and coordinate overall project implementation. The three participating city/county governments are the implementing agencies (IAs), and they have already established local project management offices (LPMOs) to supervise and coordinate overall implementation of subprojects in their respective cities.

14. Three project implementing units (PIUs) physically implement the subprojects on behalf of respective IAs

15. The updated EMP prepared by CUCD and approved by the ADB provides the following outline of institutional responsibilities for EMP implementation. Roles and responsibilities for major tasks as described in the EMP were assigned to each of the agencies involved in this project. The following table also provides linkage of between the parties.

Institutional Responsibilities for EMP Implementation

Name of Organizations	Roles and Responsibilities
Executing Agency (EA) – Chuxiong Yi Minority Autonomous Prefecture Government (CPG)	*Overall policy and project control - Responsible for project coordination with three project city/town's governments, liaison with ADB, financial management and administration.*
Chuxiong Prefecture Project Leading Group (CPPLG)	*Responsible for implementation of the entire project - Headed by the Vice Mayor and consists of senior staff from DRC, FB, EPB, HURDB, TB, LRB, and PB:* Coordinate and overlook project preparation and implementation; • Provide policy guidance during project implementation; • Facilitate interagency coordination.

Name of Organizations	Roles and Responsibilities
ADB Chuxiong Prefecture Project Management Office (CPPMO)	*Reporting to the CSPLG, supervise and provide overall management to ensure smooth project implementation:* • Responsible for all day-to-day management for project preparation and implementation; • Designate one environment specialist as EMP coordinator; • Communicate and coordinate with ADB for project management and implementation; • Monitors and reports on project implementation progress and prepares compliance monitoring to ADB; • Submit bidding documents, bid evaluation reports and other necessary documents to ADB for approval where necessary; • Procure and engage project management consulting service, including loan implementation environmental consultant (LIEC) to assist in supervision, tracking and reporting on EMP implementation of all subprojects; • Procurement of external environment monitor (EEM); • Compiling environmental monitoring reports prepared by the LPMOs for submission to ADB;
Implementing Agencies (IAs) - Governments of Chuxiong City, Lufeng County, and Wuding County	*Primary responsibility for project implementation of local project components in their jurisdictions, including finance and administration, technical and procurement matters, monitoring and evaluation, and safeguard compliance. Day-to-day activities delegated to LPMOs (see below)*
Local Project Leading Groups (LPLGs)	• *Overall coordination of project preparation and implementation:* • *Provide policy guidance during implementation:* • *Facilitate interagency coordination at the local level.*
Local Project Management Offices (LPMOs), established under IAs	*Responsible for all day-to-day management for project implementation:* • Communicate and coordinate with CPPMO for project management and implementation; • Establish environment management unit (EMU) within LPMOs; • Work with PIUs, ensuring EMP requirements are fully incorporated into bidding documents; • Establishment of a Grievance Redress Mechanism (GRM) with a dedicated Project Complaints Coordinating Unit (PCCU). • Supervise and monitor EMP implementation and prepare semi-annual reports to CPPMO (with support of LIEC); • Participation in capacity building and training programs;

Name of Organizations	Roles and Responsibilities
Project Implementation Units: • Chuxiong Development & Investment Co. Ltd (CDIC) • Lufeng Urban Construction Investment Co. (LUCIC) • Wuding Urban Construction Investment Co. (WUCIC)	*Ensuring successful implementation of project sub-components:* • Appoint one Environmental Specialist as EMP Coordinator; • Issue tenders for contractors & equipment with assistance of tendering agency; • Administer and monitor performance of contractors and suppliers; • Carry out construction supervision and quality control; • Contracting with local environment monitoring stations (EMS) to conduct environment impact monitoring work; • Procure and manage contract with construction supervision Companies (CSC) required for subproject implementation in accordance with PRC and ADB procedures and regulations; • Participate in capacity building and training programs; • Facility commissioning
Facility Operators • Water Resource Bureaus; • Urban Management Bureaus; • Transport Management Bureaus; • Traffic Police	*Ensuring successful ongoing operation and maintenance of the relevant subproject components:* • In conjunction with PIUs, conduct commissioning of the constructed facilities • O&M of completed facilities, including environmental management, monitoring and reporting responsibilities.

16. Under the overall leadership of the Chuxiong Prefecture Project Leading Group (CPPLG), the Chuxiong Prefecture Project Management Office (CPPMO) has the responsibility to supervise and coordinate all project activities for EMP implementation.

17. Specifically, participating project city/counties, i.e. governments of City of Chuxiong and counties of Wuding and Lufeng are the project implementation agencies (IAs). Each of the local IAs has established their respective local project management office (LPMOs) early 2014 to supervise and coordinate implementation of local project components.

18. Specific project implementation responsibilities in each of the participating city/counties have been assigned to local agencies as Project Implementation Units.

19. **Environment Staff within LPMOs, CPPMO and PIUs -** The LPMOs will have main EMP coordination responsibility. Therefore, each LPMO has established an **environmental management unit (EMU)** and designate a leader and an appropriate number of staff to coordinate environmental issues associated with each component, subcomponent and contract package.

20. The EMUs take charge of (i) coordinating the implementation of the EMP and developing implementation details; (ii) supervising the implementation of mitigation measures during project construction and operation; (iii) ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management plans; (iv) submitting quarterly EMP monitoring and progress reports to the CPPMO; (v) coordinating the local grievance redress mechanism (GRM); and (vi) responding to any unforeseen adverse impact beyond those mentioned in the domestic EIAs, the project EIA and the EMP. The EMUs is technically supported by the loan implementation

environment consultants (LIECs). The CPPMO and the PIUs will nominate one staff to act as environmental coordinator to check the overall implementation of environmental management provisions of the EMP.

21. **Loan Implementation Environment Consultant -** The LIEC retained under the project implementation consultant services (PIC) will advise the CPPMO, LPMOs, PIUs, contractors and CSCs on all aspects of environmental management and monitoring for the project. Specifically, the LIEC will:

A. Assist in updating the EMP and environmental monitoring program, as needed, following the detailed design of project components;

B. Guide the implementation of the mitigation measures specified in the EMP;

C. On behalf of the LPMOs and CPPMO, prepare the semi-annual EMP monitoring and progress reports in English;

D. Provide training to the CPPMO, LPMOs, PIUs, CSCs, in requirements of PRC's environmental laws, regulations and policies, ADB SPS 2009, EMP implementation, and GRM, etc. in accordance with the tentative training plan defined in Table 5-2;

E. Identify any environment-related implementation issues, and propose necessary corrective actions;

F. Undertake site visits as required.

22. **Construction Contractors** - Construction contractors will be responsible for implementing relevant mitigation measures provided in the EMP as part of the contract agreement for all construction activities under the supervision of the Construction Supervision Companies (CSCs) and PIUs. Construction contractors will also be responsible for conducting internal environmental monitoring. Where appropriate, the contractors may contract local environmental monitoring stations (EMS) or other suitably qualified agencies to provide monitoring services to assess potential environmental impacts that may result from construction activities.

23. **Construction Supervision Companies (CSCs)** - CSCs will be selected through the PRC bidding process by the PIUs. The CSCs will be responsible for supervising construction progress and quality, and EMP implementation at construction sites. Each CSC shall have at least one environmental engineer at each construction site to: (i) supervise the contractor's EMP implementation performance; and (ii) prepare the contractor's environmental management performance section in monthly project progress reports for submission to the PIUs and LPMOs.

24. **Environmental Monitoring Stations (EMS)** - The IAs will appoint the EMS of each project city/county to conduct periodic environmental impact monitoring during construction and operation in accordance with the environmental impact monitoring plan (Table 3-6 and Table 3-7).

25. **External Environment Monitor (EEM)** - The EA will engage an independent, external environment monitor to examine and verify the project's environmental performance by: (i) conducting independent verification of the project's environmental management performance, including identification of any environment-related implementation issues and EMP compliance issues; (ii) reviewing environmental impact monitoring results of the local environmental monitoring stations, and EMP monitoring and progress reports prepared by LPMOs and CPPMO, comparing predicted with actual environmental impacts, assessing the effectiveness of the

mitigation measures, and suggesting enhancement measures, as required; (iii) providing advice to CPPMO, LPMOs and PIUs on required corrective actions; and (iv) submitting EMP implementation compliance verification reports to CPPMO, LPMOs, PIUs (in Chinese) and ADB (in English) on an annual basis during project implementation period.

3.2 Incorporation of Environmental Requirements into Project Contractual Arrangements

26. During this reporting period, CUCD reviewed and provided comments and suggestions in the drafting of contract bid documents as well as provided specific requirements for incorporation in bid and contract documents. As such, contract documents for all civil works contracts contains specific responsibilities, tasks and activities required for the proper implementation of the EMP. By the end of December 2016, Chuxiong has issued 9 tender bids and signed 8 contract agreements.

Specific documents prepared for the implementation of EMP:

A. A separate document, "EMP Responsibilities for Contractor", was prepared that details the roles and responsibilities of all civil work contractors for the implementation of EMP.

B. Similarly, a similar document, "EMP Responsibilities for CSC", was also prepared that details the roles and responsibilities of all construction supervision companies for the implementation of EMP.

C. A 3rd document, "EMP Responsibilities for EMS", was prepared that details the roles and responsibilities of Environmental Monitoring Stations that are retained either by the local PIUs or civil works contractors. The document specifies various types of monitoring requirements, QA/QC procedures and requirements, sampling and analytical methods, monitoring media, e.g. air, surface or noise, analytical parameters, as well as reporting requirements and frequencies.

D. Monthly report submission schedule for each of the civil works contractor was prepared by CUCD; meanwhile, quarterly report submission schedule for LPMO was also prepared by CUCD, and transferred to LPMO. The detailed schedule will help contractors and LPMO submit relevant reports timely according to the requirements EMP.

E. A notification was issued by CPPMO basing on the existing environmental management problems arose during the implementing EMP. The notification re-clarified the responsibility of LIEC, EMP coordinator in CPPMO, environmental leader and coordinator in EMU; and performed the duties to the people. The notification unified the audit procedure and submission schedule for environmental report; unified the relevant matters of environmental monitoring during the construction phase and stressed the need to pay attention to the important matters in EMP.

27. CUCD has advised the CPPMO, all LPMOs and PIUs that the content of these specific documents must be fully incorporated into all bid documents and in the actual contract agreements to be signed with respective parties. It is also of critical importance that the bid prices from potential contractors, CSCs and EMS have taken into consideration of EMP requirements and the cost for EMP implementation is fully included in the total contract prices.

4.0 COMPLIANCE WITH PROJECT COVENANTS RELATING TO ENVIRONMENTAL MANAGEMENT

28. To date, all covenants in the Loan Agreement and Project Agreement have been executed as stipulated, while some are still to be enacted. A list of covenants and compliance status related to the environmental aspect is shown in the following table.

Compliance with Environment Related Project Covenants

Item	Environment Related Specific Covenants	Status of Compliance
1	CPG shall ensure, and cause the Project Implementing Agencies to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with: a) all applicable laws and regulations of the Borrower relating to environment, health and safety; b) the Environmental Safeguards; c) all measures and requirements set forth in the EIA, and the EMP, and any corrective or preventive actions (i) set forth in a Safeguards Monitoring Report, or (ii) subsequently agreed between ADB and CPG. CPG shall cause the Project Implementing Agencies to incorporate such respective mitigation and monitoring measures into the design and bidding documents and construction contracts.	Being complied with at each stage of project implementation
2	CPG shall ensure, and cause the Project Implementing Agencies to ensure that: a) no artificial structures will be constructed to impound water restricting free flow of flood waters in the project rivers, and b) no river sediment dredging is carried out unless a sediment management plan is developed, defining a minimum sediment treatment, transport, disposal and reuse and shared with ADB, and disclosed to affected people by environmental safeguards. CPG shall cause the Project Implementing Agencies to ensure that spoil and dredged material generated in the course of implementation of the Project is tested and disposed of in accordance with national and local laws and regulations, and that such disposal creates no significant risk of secondary pollution.	Being complied with at applicable stages of project implementation
3	CPG shall cause Chuxiong Prefecture Water Resource Bureau to review and adjust the operating procedures of the Qingshanzui Reservoir to ensure that the Longchuan River receives a minimum flow at all times in accordance with the reservoir operating rule on minimum flow provision as defined in reservoir EIA approved by the Ministry of Environmental Protection in 2005	Being compiled with
4	CPG shall cause the Project Implementing Agencies to implement the necessary noise mitigation measures along the Project roads in accordance with the requirements specified in the EMP and applicable national environmental protection regulations.	Being complied with at relevant stages of project activities
5	CPG shall make available, and cause the Project Implementing Agencies to make available, necessary budgetary and human resources to fully implement the EMP, (the RPs and the REMDP).	Being complied with at applicable stages of project activities

Item	Environment Related Specific Covenants	Status of Compliance
6	CPG shall ensure, and cause the Project Implementing Agencies to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: a) comply with the measures relevant to the contractor set forth in the EIA and the EMP (to the extent they concern impacts on the respective affected people under the Environmental Safeguards, and any corrective or preventative actions set forth in (i) a Safeguards Monitoring Report or (ii) subsequently agreed between ADB and CPG; b) monitor relevant environmental impacts caused by the construction and installation activities and report to the supervising project management office of the Project Implementing Agencies; c) make available a budget for all such environmental measures; d) provide the Project Implementing Agencies with a written notice of any unanticipated environmental risks or impacts that arise during construction, implementation or operation of the project that were not considered in the EIA and the EMP; e) adequately record the condition of roads, agricultural land, physical cultural resources and other infrastructure prior to starting to transport materials and construction; and f) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition as soon as possible and no later than the completion of construction.	Being complied with and all specific requirements are being incorporated in all bidding documents and contracts
7	CPG shall do, or cause the Project Implementing Agencies to do, the following: a) submit Safeguards Monitoring Reports to ADB in respect of implementation of and compliance with Environmental Safeguards and the EMP, annually during construction and the implementation of the Project and the EMP until the issuance of ADB's Project completion report unless a longer period is agreed in the EMP; and disclose relevant information from such reports to respective affected people under Environmental Safeguards promptly upon submission; b) If any unanticipated environmental risks and impacts arise during construction, implementation or operation of the Project that were not considered in the EIA and the EMP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan; c) No later than the date of award of Works Contract, i. Update the EMP, if necessary in order to fully take into account the final detailed design, and submit to ADB for its concurrence; ii. Engage a qualified and experienced external environmental expert, acceptable to ADB, to verify information produced through the environmental monitoring process, and to facilitate the carrying out of any verification activities; and iii. Contract licensed environmental monitoring agencies who conduct periodic environmental impact monitoring in accordance with the approved monitoring plan; d) Report any actual or potential breach of compliance with the measures and requirements set forth in the EMP promptly after	Being compiled with all items excluding the requirement of external environmental expert. The contract of EEM with CPPMO was terminated in 2016.

Item	Environment Related Specific Covenants	Status of Compliance
	becoming aware of the breach.	
8	Safeguard Grievance Redress Mechanism - CPG shall ensure that separate safeguards grievance redress mechanisms acceptable to ADB are established in accordance with the provisions of the EIA and EMP at its project management office, within the timeframes specified in the relevant EIA and EMP to consider safeguards complaints.	Complied with – Grievance Redress Mechanism establish with full documentation and management procedure
9	Applicability of ADB Safeguard Policies – CPG shall ensure that the provisions of the EIA and EMP as well as any requirements under the Safeguards Policy Statement also apply to the portion of the Project to be financed by the Project Implementing Agencies and commercial banks.	Being complied with
10	Public Awareness – CPG shall cause the Project Implementing Agencies to undertake public awareness campaigns on the Project and its benefits, including but not limited to information related to the EMP, to be conducted through information disclosure, education and consultation, in both local dialect and Madarin.	Being complied with -

5.0 ENVIRONMENTAL MITIGATION MEASURES IMPLEMENTED IN THIS REPORTING PERIOD

29. There are eight contracts on-going at present in Chuxiong project:

A. China Railway Shanghai Engineering Bureau Corporation was awarded the contract of CCX4 sub-project in Chuxiong city and mobilized construction activities on November 30th, 2015. To June 2016, construction of roadbed including road cleaning, excavation, and filled, and road pavement has been implemented. In coordination with the Underground Comprehensive Pipe Gallery Construction at the same site, the construction of CCX4 was in shutdown period from 25th June, 2016 to 31th December, 2016. It will restart in March, 2017.

B. Beijing Urban Construction Road & Bridge Co. Ltd was awarded the contract of CWD1 sub-project in Wuding County and started construction on November 13th, 2015.

C. Yunnan Zhenghao Construction Engineering Co Ltd. got the bid of CWD4-1 sub-project in Wuding County and started works on 20th, October, 2015. The construction of CWD4-1 was in shutdown process from July to September, 2016 due to the resettlement problems.

D. Beijing Urban Construction Road & Bridge Co. Ltd. won the bid of CWD2 sub-project in Wuding County and mobilized in October, 2016.

E. Beijing Xinchang Road & Bridge Co. Ltd was awarded the contract of CWD3 sub-project in Wuding County and started works in October, 2016.

F. Yunnan Zhenghao Construction Engineering Co Ltd. got the bid of CWD4-2 sub-project in Wuding County and started construction in November, 2016.

G. Guangdong Dayu Water Resource Construction Co. Ltd got the bid of CLFR1 sub-project in Lufeng County and started construction in November, 2016.

H. Xinzhou Proprietary Corporation won the bid of CCX1 sub-project in Chuxiong City and mobilized in December, 2016.

30. Mitigation measures taken by eight contracts:

A. In terms of CCX1 (11Road), CWD1 (Beichengdadao Road), CWD2 (Wuchan Road & Wuxu Road), CWD3 (Chengbei Road), CWD4-1 (Wuzheng Road), CWD4-2 (Mudan Road – Caiyuan Road – Binghe Road), and CLFR1 (East- West River enhancement), mitigation measures have been taken by the construction contractors in accordance with the requirement of the EMP. The construction contractors of CWD2, CWD3, CWD4-2, CLFR1 and CCX1 have prepared the corresponding Construction site EMP (CS-EMP) based on the project EMP, and prepared the monthly progress reports from October to December, 2016. The construction contractors of CWD1and CWD4-1 have prepared the monthly progress reports from July to December, 2016. Potential environmental impacts and the respective mitigation measures undertaken during this reporting period are described in the monthly progress reports of seven contractors (no monthly report requirement for CCX4 from July to December for it is in shutdown period; and in terms of CWD4-1, the contractor prepared the monthly report from July to September even it is in shutdown period.).

B. The CSC of Chuxiong City Road Construction Project and Wuding County Road Construction and River Enhancement Project were awarded to Kunming Construction Consulting & Supervising Co. Ltd. And the CSC of Lufeng County Road Construction and River Enhancement were awarded to Yunnan Urban Construction Consulting & Supervising Co. Ltd. The CSCs supervised construction progress and quality, and EMP implementation at construction sites based on the project EMP. The CSCs have prepared monthly project progress reports at three construction sites to assess the contractor's EMP implementation performance, including the monthly report in December in Chuxiong City, the monthly report from July to December in Wuding County, and the monthly report from November to December in Lufeng County.

C. The EMUs in the LPMO have prepared the quarterly report to evaluate the mitigation measures taken by the construction contractors, and summarize the environmental monitoring results from CPEMS. The quarterly reports during the reporting period include 3rd &4th quarterly reports from LPMOs in Chuxiong City and Wuding County, 4th quarterly report from LPMO in Lufeng County.

D. Potential environmental impacts and the respective mitigation measures undertaken during this reporting period are summarized in the table 5.1. Some pictures were provided by the CSCs to illustrate the mitigation measures undertaken in Figure 5.1, Figure 5.2, Figure5.3, Figure5.4, Figure5.5 and Figure5.6.

Table 5.1- Summary of Potential Impacts & Implementation of Mitigation Measures

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
A. Preconstruction Phase			
	Establishment of environmental units at different levels of supervision	1. Establish an EMU in each of the LPMOs, including at least one environment specialist 2.Appoint environmental coordinators for EMP coordination within CPPMO and PIUs. Environmental coordinator at CPPMO: Sun Zuan (15987203968) EMU leader at LPMO in Chuxiong City: Li Guangli (13187658005) Environmental coordinator at LPMO in Chuxiong: Chen Lei (13312608823) EMU leader at LPMO in Wuding County: Yang Youqing (18987803677) Environmental coordinator at LPMO in Wuding: Zhang Lei (15125781064) EMU leader at LPMO in Lufeng County: Liao Yuhong (13638773847) Environmental coordinator at LPMO in Lufeng: Chen Zhijuan (15969331480) Chen Dongyu (18008785393)	1.Being complied with 2.Being complied with
	Updated EMP	3. Update mitigation measures defined in this EMP based on final detailed design, as needed, submit to ADB for disclosure. 4. In case of major change of project location (or additional physical component) that may cause	3&4. No updated action taken

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		substantial environmental impacts or involve additional affected people, IAs and PMOs should form an EIA team to conduct additional environmental assessment and also public consultation. The revised EIA reports should be submitted to relevant EPB and ADB for approval and disclosure. To determine whether the change is minor or major, City PMOs should consult with ADB.	
	Environmental monitoring stations	5.Prior to construction, engage EMS 6.Prepare a detailed environmental monitoring plan in accordance to monitoring plan defined in this EMP.	5. Being complied with 6.Being complied with
	Project Implementation Consultant Services (PIC)	7.Engage loan implementation environmental consultant (LIEC)	7. Being complied with
	External environment monitor (EEM)	8. Engage external environment monitor (EEM) to verify the project environmental performance and compliance with the EMP CPPMO signed a contract with Yunnan New Century Environmental Protection Sciences Co. Ltd in January, 2016. The contract was terminated in August, 2016.	8.Being complied with
	Bidding and Contract Documents	9. Prepare environment section in the terms of reference for bidders; 10. Prepare environmental contract clauses for contractors, namely the special conditions (e.g., reference to EMP and monitoring table).	9. Being complied with 10.Being complied with
	EMP training	11. PIC, LIEC or invited environment specialists and/ or officials from the provincial EPB and the Prefecture EPB provide training on construction environmental management and implementation and supervision of environmental mitigation measures to contractors and CSCs in accordance with training plan defined in this EMP.	11.Being complied with
	Establish operational GRM	12. Establish a Project Public Complaints Unit (PPCU) in each LPMO; provide training for PPCU members and GRM access points; 13. Disclose the PPCU's phone number, fax, address, and email to the public on City EPB's website and on information boards at each construction site.	12. PPCUs have been established in Chuxiong, Wuding and Lufeng LPMO. 13. PPCU information has been disclosed through multi-media, i.e. website, an announcement poster.
	Environmental Conditions at	14. Each civil works contractor shall prepare a Construction site EMP (CS-EMP), based on this	14. Being complied with

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
	construction site, as identified in the EMP	project EMP, to include the following plans: – Site drainage and soil erosion management; – Spill control and management; – Environmental, health & safety management plan; – Surface water protection; – Temporary traffic management; – Construction site access control;	eight site EMPs of CCX1, CCX4, CWD1, CWD2, CWD3, CWD4-1, CWD4-2, and CLFR1.
B. Construction Phase			
Air	Dust generated by construction activities	1. Spray water daily on construction sites and earth/material handling routes where fugitive dust is being generated; 2. Pay particular attention to dust suppression need 3. Cover materials during truck transportation, in particular for fine materials to avoid spillage or dust generation.	1. Being complied with (Figure 5.1) 2. Being complied with 3. Being complied with (Figure 5.1)
	Air emission from asphalt paving operation, & vehicles & machinery	4.Locate asphalt plants and mixers as far away as possible (at least 500 m downwind) from the nearest residential areas, and other sensitive receptors; 5. Store petroleum or other harmful materials in appropriate places with covering to minimize emission; 6. Maintain vehicles and construction machinery regularly to a high standard of efficient running and fuel-burning to ensure emissions from vehicle and construction machineries are in compliance with the PRC standards of GB18352-2005, GB17691-2005, GB11340-2005, GB2847-2005, and GB18285 -2005; and 7. Initiate a regular inspection and certification system for vehicle and equipment emission.	4&5.The petroleum is not on-site 6. Being complied with 7.Being complied with
Noise	Noise generated from construction activities	1. Ensure that noise levels from equipment and machinery conform to the PRC standard of GB12523-90, and properly maintain construction vehicles and machineries to minimize noise; 2. Apply noise reduction devices or methods where piling equipment is operating within 300m of sensitive sites such as schools, hospitals and residential areas; 3. Locate sites for rock crushing, concrete-mixing, and similar activities at least 1 km away from sensitive areas; 4. To reduce noise at night, restrict the operation of machinery generating high levels of noise, such as piling, and movement of heavy vehicles along urban and village roads between 22: 00 and 06: 00 the next day in accordance with PRC regulations; 5. Take special precaution at construction sites that	1. Being complied with 2. Piling equipment is not on-site. 3. Being complied with 4. Being complied with 5. Being complied with

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		are close to such sensitive sites as schools, hospitals and office buildings. When construction activities are unavoidable during the school seasons, the use of heavy equipment will be restricted to weekends and non-class hours. 6. Place temporary hoardings or noise barriers around noise sources during construction, if necessary; 7. Monitor noise at sensitive areas at regular intervals (refer to the monitoring plan in the EMP). If noise standards are exceeded, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation; and 8. Conduct monthly interviews with residents living adjacent to construction sites to identify community complaints about noise, and seek suggestions from community members to reduce noise annoyance. Community suggestions will be fully considered and addressed.	6. Being complied with 7. Noise monitoring was conducted in 3rd &4th quarter, 2016, in Wuding County. Noise at some sensitivity sites was beyond the class II. Meanwhile, noise monitoring did not conducted in Chuxiong and Lufeng during the reporting period. 8. Being complied with (Figure 5.2)
Soil	Soil erosion	Develop and implement a Site Drainage and Soil Erosion Management Plan that responds to the SEPP (Site Erosion Protection Plan) approved by local Water Resources Bureau, and the project EIA. Measures shall include the following: 1.During road and bridge constructions, maintain slope stability at cut faces by implementing erosion protection measures such as terraces and silt barriers; 2.Stabilize all cut slopes, embankments, and other erosion-prone working areas while works are going on; 3.All earthwork disturbance areas must be stabilized within 30 days after earthworks have ceased at the sites; 4.Minimize active open excavation areas during trenching activities and use appropriate compaction techniques for pipe trenches construction; 5.Provide temporary detention ponds or containment to control silt runoff; 6.Construct intercepting ditches and drains to prevent runoff entering construction sites, and divert runoff from sites to existing drainage; 7.Strip and stockpile topsoil, cover or seed temporary soil stockpiles; 8. Limit construction and material handling during periods of rains and high winds; 9. Properly slope or re-vegetate disturbed surfaces, such as compacted pipeline trenches and cut banks;	1. Being complied with (Figure 53) 2. Being complied with (Figure 5.3) 3.Being complied with 4. Being complied with (Figure 5.3) 5.Alternative way is adopted: 6. Being complied with (Figure 5.3) 7. Being complied with 8.Being complied with 9. Being complied with (Figure 5.3) 10.Being complied with

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		10. Protect slopes on both sides of bridges and culverts; 11. Plant grass to protect slopes, especially on sandy soil and terraced slopes; 12.Appropriately set up temporary construction camps and storage areas to minimize the land area required and impact on soil erosion;	11 Being complied with (Figure 5.3) 12. Being complied with (Figure 5.3)
	Soil contamination	1. Properly store petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas, and use best management practices to avoid soil contamination; 2. Remove all construction wastes from the site to approved waste disposal sites; 3. Establish emergency preparedness and response plan (Spill Management Plan); 4. Provide spill clean-up measures and equipment at each construction site and require contractors to conduct training in emergency spill response procedures.	1.Being complied with 2. Being complied with 3..Being complied with 4.Being compiled with
Water	Impact on river hydrology by bridge construction	1.River bridge pier constructions (10 bridges - 2 in Chuxiong, 6 in Wuding, 2 for Lufeng) shall be conducted during the dry season; construction during the rainy season will be prohibited; 2. Foundation treatment and pier grouting come first in pier construction; and 3. Provide adequate opening for flood flow before the rainy season.	1. Being complied with 2.Being complied with 3. Being complied with
	Impact on river hydrology by river rehabilitation works	1. Cofferdam diversion will be set along the proposed rivers; and 2. River bank constructions shall be conducted during the dry season (from October to May), and construction during the rainy season shall be prohibited.	1. Being complied with 2. Being complied with CLFR1 mobilized in November, 2016.
	Surface and groundwater pollution	Contractors will be requested to implement the following measures to protect surface and groundwater resources: 1. During bridge and river bank constructions, pump slurry to shore and properly dispose cutting materials; 2. Install sediment traps along river to minimize sediment runoff into rivers during earthworks; 3. Works on the river bed, including sediment dredging, shall not be conducted without prior assessment of environmental impacts, and dredged material management planning; 4. Develop contingency plans for control of oil and other dangerous substances (Spill Management Plan); 5. Collect wastewater from construction activities in sedimentation tanks, retention ponds, and filter	1. Being complied with 2. Being complied with (Figure 5.4) 3. Being complied with 4. Being compiled with 5.Being compiled with

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		tanks to remove silts and oil; 6.Equip all areas where construction equipment is being washed with water collection basins and sediment traps; 7. Fuel storage areas, maintenance shop and vehicle cleaning areas to be located at least 500m away from the nearest water body; 8. Storage facilities for fuels, oil, and other hazardous materials to be within secured areas on impermeable surfaces, and provided with bunds and cleanup installations; 9. Ensure that fuel suppliers are properly licensed. They shall follow proper protocol for transferring fuel and the PRC standard of JT3145-88 (Transportation, Loading and Unloading of Dangerous or Harmful Goods); 10. Locate labor camps at least 500m from ecologically sensitive receivers, such as rivers, residential areas and natural ponds, etc.; 11. Install eco-toilets and septic treatment and disposal systems at construction camps along with proper maintenance protocols; 12. The discharge of construction wastewater to the rivers will be prohibited; 13. Conduct water quality monitoring in the rivers and the natural ponds during construction in accordance with the EMP monitoring program to identify and confirm results of the impact assessment and effectiveness of adopted mitigation measures.	6. No action 7. Being complied with 8. Not being involved. 9. Being compiled with 10. Being compiled with 11. Being compiled with CWD2, CDW3, CWD4-2 and CLFR1 (Figure 5.4); CCX1 did not establish camps. 12.Being compiled with 13. Water sample was taken during reporting period in Wulong River, Caiyuan River, and East-west River.
Solid Waste	Solid waste generated by construction activities and from workers' camps	1. Provide appropriate waste collection and storage containers at locations away from surface water or sensitive receivers; 2. Reach agreement with municipal waste collection services for regular collection of waste prior to construction; 3. Properly remove and dispose of any significant residual materials, wastes and contaminated soils that remain on the ground timely during and after construction to designated sites. 4. Any planned paving or vegetating of the area shall be done as soon as the materials are removed to protect and stabilize the soil; 5. Burning of waste is strictly prohibited; 6. Provide sufficient garbage bins at strategic locations and ensure that they are protected from birds and vermin, and emptied regularly (using the	1. Being complied with (Figure 5.5, except CCX1). 2. Being complied with, except CCX1. 3. Being complied with (Figure 5.5). 4.Being compiled with 5. Being strictly prohibited 6. Being compiled with, except CCX1.

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		municipal solid waste collection systems).	
Flora and Fauna	Protection of vegetation, and fauna	1. Protect existing vegetation nearby construction sites; 2. Properly backfill, compact and re-vegetate pipeline trenches after pipeline installation; 3. Protect existing trees and grassland during road, bridge, river rehabilitation and pipeline constructions; where a tree has to be removed or an area of grassland disturbed, replant trees and re-vegetate the area immediately after construction; 4. Remove trees or shrubs only as a last resort if they impinge directly on permanent works or approved necessary temporary works; 5. In compliance with the PRC's forestry law, undertake compensatory planting of an equivalent or larger area of affected trees and vegetation; and 6. Use native plant species of local provenance will for replanting; 7. Take special precautions during and after construction for the protection of small animals, reptiles, and birds of common species that live in the vegetated roadside and riverside areas, medians, inner areas of bridges, and green areas	1.Being compiled with 2.Being compiled with 3. Being compiled with 4. Not being involved 5. Not being involved 6. Not being involved 7. Being compiled with
Socio-Economic impact	Impact on physical cultural resources	1.Contractors shall establish chance-find procedures for physical cultural resources; 2.If a new site is unearthed, work shall be stopped immediately and local BCR and the LPMO promptly notified, and construction will resume only after thorough investigation and with the permission of the appropriate authority	1. Being compiled with 2. No physical cultural resources found right now
	Community Health & safety	The civil work contractors shall implement the following measures to ensure community health and safety during construction: 1. Develop and implement temporary traffic control and operation plan, to be cleared by local traffic management administrations before construction. The plan shall include provisions for diverting or scheduling construction traffic toavoid morning and afternoon peak traffic hours, regulating traffic at road crossings, selecting transport routes to reduce disturbance to regular traffic, reinstating roads, and opening them to traffic as soon as the construction is completed; 2. Conduct underground facilities survey and protection to avoid disturbances to utility services, where needed. 3. Disclose information to residents and businesses in advance through media of the construction activities, given the dates and duration of expected disruption;	1. Being compiled with 2. Being compiled with 3.Being compiled with

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		4. Ensure that construction sites are well protected but placing clear signs at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc., and raising awareness on safety issues. All sites shall be secured, disabling access by members of the public through appropriate fencing whenever appropriate	4.Being compiled with (Figure 5.6, except CCX1)
	Occupational health and safety	Each civil works contractor shall develop and implement an environmental, health and safety management plan (EHSMP) which shall include the following provisions: 1. Provide a clean and sufficient supply of fresh water for construction sites and for all camps, offices and workshops; 2. Provide an adequate number of latrines and other sanitary arrangements at construction sites and work camps, and ensure that they are cleaned and maintained in a hygienic state; 3. Garbage receptacles at construction site and camps will be setup, which will be periodically cleared to prevent outbreak of diseases; 4. Provide personal protection equipment, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations for workers; 5. An emergency response plan in case of accidents and emergencies will be prepared, including environmental and public health emergencies associated with hazardous material spills and similar events. This plan shall be submitted to the local EPBs for review and appraisal. Emergency phone link with hospitals in the three project towns will be established. A fully equipped first-aid base at each construction camp will be organized; 6. A records management system that will store and maintain easily retrievable records protected against loss or damage will be established. It will include documenting and reporting occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits; 7. Ensure that occupational health and safety matters are given a high degree of publicity to all persons regularly or occasionally on each construction site. Posters will be displayed prominently in relevant areas of the site; and 8. Train all construction workers in basic sanitation, general health and safety matters, and on the specific hazards of their work.	1.Being compiled with (Figure5.6) 2.Being compiled with (Figure 5.4) 3. Being compiled with (Figure 5.5) 4. Being compiled with (Figure 5.6, except CCX1) 5.Being compiled with 6. Being compiled with 7. Being compiled with (Figure 5.6, except CCX1) 8. Being compiled with (Figure 5.6, except CCX1)

Subject	Potential Impact	Mitigation Measures	Implementation Status & Compliance with EMP
		9. Implement SITs/HIV/AIDS and other communicable diseases awareness and prevention program to target the local community and construction workers.	9. Being compiled with (Figure 5.6, except CCX1)

Figure 5.1 Mitigation measures undertaken at construction sites（Dust prevention）

CCX1-spray water

CCX1-cover materials

CWD1-spray water

CWD1- cover materials

CWD1-spray water

CWD2-spray water

CWD3-spray water

CWD4-1 –spray water

CWD4-2 – spray water

Figure 5.1 Mitigation measures undertaken at construction sites（Dust prevention）

CLFR1 – spray water

CLFR1- cover materials

CWD2- cover materials

Figure 5.2 Mitigation measures undertaken at construction sites（Noise alleviation）

CWD1-Noise supervision board

CWD4-1Noise supervision board

CWD2- EPM board

CWD3- EPM board

CWD2- construction fence

CWD3- construction fence

CWD4-2- construction fence

CLFR1- construction fence

CWD1- interview with residents

Figure 5.2 Mitigation measures undertaken at construction sites（Noise alleviation）

CWD2- interview with residents

CWD3- interview with residents

CWD4-2- interview with residents

Figure 5.3 Mitigation measures undertaken at construction sites（Water and Soil Conservation）

CWD1- maintain slope stability

CWD3 - maintain slope stability

CWD- plant grass

CWD2- stabilize roadbed

CWD3- stabilize roadbed

CWD4-2 - stabilize roadbed

CLFR1 - stabilize roadbed

CWD4-2 - maintain slope stability

CWD4-2 maintain slope stability

CWD3- construct ditches

CWD4-1- construct ditches

CWD4-2- construct ditches

Figure 5.3 Mitigation measures undertaken at construction sites（Water and Soil Conservation）

CWD2- rent houses offices

CWD3- rent houses offices

CWD4-2- rent houses offices

Figure 5.4 Mitigation measures undertaken at construction sites（Water Pollution Control）

CWD2- construction camp

CWD2- septic treatment

CWD2-bathing room

CWD2- eoc-toilets

CWD32- construction camp

CWD3- septic treatment

CWD3-bathing room

CWD3- eoc-toilets

CWD4-2 2- construction camp

Figure 5.4 Mitigation measures undertaken at construction sites（Water Pollution Control）

CWD4-2- eoc-toilets

CWD4-2- septic treatment

CLFR12- construction camp

CLFR1- eoc-toilets

CLFR1- septic treatment

CLFR1- sediment trap

Figure 5.5 Mitigation measures undertaken at construction sites（Solid Waste Collection）

CWD1- remove soil on the ground

CWD2- garbage bin

CWD2 –waste storage container

CWD3- garbage bins

CWD3- solid waste collection

CWD4-2- garbage bins

CWD4-2 construcion waste collection

CLFR1- garbage bins

CLFR1–waste storage container

Figure 5.5 Mitigation measures undertaken at construction sites（Community & Occupational health and safety）

CWD1- environmental management board

CWD1-security warning signs

CWD1- civilization construction advocacy

CWD1-safety and EM signs

CWD1- traffic control sign

CWD2-environmental sign

CWD2-warning signs

CWD2-key area fencing

CWD2- fresh water

Figure 5.5 Mitigation measures undertaken at construction sites（Community & Occupational health and safety）


CWD2- protection equipment


CWD2-health and safety training


CWD2 –services canteen


CWD3-warning signs


CWD3- civilization construction advocacy


CWD3- protection equipment


CWD3 health and safety training


CWD3- safety inspection


CWD3- leaders on-site inspection


CWD3 2- fresh water


CWD3-security warning signs


CWD4-2- fresh water


CWD4-2 -warning signs


CWD4-2 - protection equipment


CWD4-2 health and safety training

Figure 5.5 Mitigation measures undertaken at construction sites（Community & Occupational health and safety）

CLFR1-security warning signs

CLFR1-security warning signs

CLFR1-warning signs

CLFR1- civilization construction advocacy

CLFR12- fresh water

CLFR1-medicine supply

CLFR1- protection equipment

CLFR1 health and safety training

CLFR1- site safety meeting

6.0 SUMMARY OF ENVIRONMENTAL MONITORING

6.1 Monitoring Plan and Responsibilities

31. The environmental monitoring plan for this project is summarized in tables, 6.1, 6.2 and 6.3. The plan includes the scope of monitoring, monitoring media, monitoring parameters, and the frequency for each type of monitoring. Monitoring methods (table 6.4) follows those provided by the national standards in the PRC for pollution monitoring. Standard limits from national environmental quality standards and pollutant discharge and emission standards in PRC. Environmental Reporting Plan is listed in the table 6.5.

Table 6.1 - Environmental Monitoring Program – Existing Environmental Condition

Subject	Parameter	Locations	Frequency
Surface Water	pH, DO,SS, NH_3-N, oil, COD_{Cr}, fecal coliforms, anionic surfactants, COD_{Mn}, BOD_5, TN, TP,	At each project bridge, 50m upstream, and 100m downstream, with GPS Coordinate identifier for sampling locations	Monitoring of Existing Environmental Conditions: Once per day for 3 consecutive days prior to commencement of site construction activities; once during the dry season
	pH, DO, SS, NH_3-N, oil, COD_{Cr}, fecal coliforms, anionic surfactants, COD_{Mn}, BOD_5, TN, TP, As, Cd	50m upstream, and 100m downstream of construction activities on project river.	
Air	TSP, SO_2, NO_x, PM_{10}	At all construction sites of Chuxiong Roads, Chuxiong River & Wuding & Lufeng (one point upwind, three points downwind)	Monitoring of Existing Environmental Conditions: Four times per day for 3 consecutive days; Once prior to commencement of construction activities.
Noise	LAeq	At the boundary of all construction sites in 4 directions (north, south, east & west) of Chuxiong Roads, Chuxiong River & Wuding and Lufeng, and sensitive receivers nearby (see Chapter IV-sensitive receivers within project area of influence)	Monitoring of Existing Environmental Conditions: Twice per day (once in day time and once at night time) for 2 consecutive days, Once prior to commencement of construction activities.

Table 6.2 - Environmental Monitoring Program - Infrastructure Components

Subject	Parameter	Location	Frequency
Construction			
Surface water	pH, DO, SS, NH_3-N, oil, fecal coliforms, anionic surfactants, TN, TP, BOD5,	At each project bridge, 50m upstream, and	Impact Monitoring: Once per day, for 3 consecutive days, 4 times per

Subject	Parameter	Location	Frequency
	COD_{Mn}, COD_{Cr}	100m downstream	year during construction activities.
Air	Inspection of dust mitigation measures (water spraying, cover transport vehicles, etc.); and maintenance of vehicles and construction equipment	Visual inspection at all construction sites.	Internal Monitoring: weekly
			External Monitoring (At least twice per year) is updated by the ADB environmental official, which will be implemented by CPEMS.
	TSP, SO_2, NO_x	At all construction sites (one point upwind, three points downwind)	Impact Monitoring: Four times per day for 3 consecutive days, 4 times per year during construction phase.
	TSP, SO_2, NO_2, PM_{10}	sensitive receivers nearby (see Chapter IV-sensitive receivers within project area of influence)	For sensitive receptors, continuous monitoring of 24 hours for consecutive 3 days, 4 times per year during construction phase.
Noise	LAeq	At the boundary of all construction sites in Chuxiong, Wuding & Lufeng and sensitive receivers nearby (see Chapter IV-sensitive receivers within project area of influence)	Impact Monitoring: Twice per day (once in day time and once at night time) for 2 consecutive days, 4 times per year during construction phase.
Solid Waste	Garbage from work-camps and construction waste at construction sites	Visual inspection at all construction sites and work-camps	Internal Monitoring: weekly
			External Monitoring: Twice per year
Soil erosion, vegetation	Soil erosion intensity, re-vegetation	Visual inspection at borrow pit and spoil sites	Internal Monitoring: Random check after rainstorm (rainfall＞50mm)
			External Monitoring :twice per year and once after completion of construction
	Slope stability, topsoil stockpile and rehabilitation of construction sites	Visual inspection of all subgrade slopes and retaining walls, bridges, culverts	Internal Monitoring: At least four times per year
			External Monitoring: twice per year and once after completion of construction
	Compensatory plantings and re-vegetation of borrow pits,	Visual inspection at all disposal sites, borrow	Internal Monitoring: At least four times per year

Subject	Parameter	Location	Frequency
	spoil disposal sites and construction sites	pits and temporary occupied lands	External Monitoring : twice per year and once after completion of construction
Occupational health and safety	Work camp hygiene and safety, availability of clean water and emergency response plans	Inspection at all construction sites and work-camps	Internal Monitoring: Monthly
			External Monitoring: Twice per year

Table 6.3 - Environmental Monitoring Program - River Rehabilitation and Flood Control

Subject	Parameter	Location	Frequency
Construction Phase			
Construction wastewater	pH, SS, oil	At discharge points of all construction sites	Impact Monitoring: One sampling each day each time, twice per year
Work-camp domestic wastewater	pH, SS, NH3-N, COD_{Cr}, oil, fecal coliforms	At domestic wastewater discharge points of all work-camps	Impact Monitoring: One sampling each day each time, twice per year
Surface water	pH, DO, SS, NH3-N, COD_{Cr}, oil, anionic surfactants, TN, TP, BOD_5, COD_{Mn}, fecal coliforms , As, Cd	50m upstream, and 100m downstream of construction activities on project river.	Internal Monitoring: one sampling each day, 3 consecutive days, 6 times per year.
			Impact Monitoring: one sampling each day, two consecutive days, 4 times per year
Air	Inspection of dust mitigation measures (water spraying, cover transport vehicles, etc.); and maintenance for vehicles and construction equipment	At all construction sites	Internal Monitoring: At least six times per year
			External Monitoring : Twice per year
	TSP, SO_2, NOx	At all construction sites of Chuxiong, Wuding & Lufeng (one point upwind, three points downwind);	Impact Monitoring: Four times per day for three consecutive days, twice per year during construction phase.
	TSP, PM_{10}, SO_2, NO_2	Sensitive receivers nearby	For sensitive receptors, continuous monitoring of 24 hours for consecutive 3 days, 2 times per year during construction phase.
Noise	LAeq	At boundary of all construction sites in Chuxiong, Wuding & Lufeng in all four directions (north, south, east & west). Sensitive receivers nearby	Impact Monitoring: Twice per day (once in day time and once at night time) for 2 consecutive days, twice per year during construction phase.

Subject	Parameter	Location	Frequency
Soil erosion	Inspection of topsoil stockpile and construction site rehabilitation (e.g. compensatory plantings)	At all construction sites	Internal Monitoring: At least four times per year
			External Monitoring : Twice per year
Occupational health and safety	Inspection of hygiene status, availability of clean water and emergency response plans	At all construction sites and work-camps	Internal Monitoring: Monthly
			External Monitoring: Twice per year

Table 6.4 - Standard Monitoring Methods of Ambient Air, Noise and Water

Media	Monitoring Parameter	Method (Standard No.)	Detection Limit	Standard Limit
Air	TSP	Gravimetric (GB/T15432-1995)	0.001 mg/m^3	0.30[1]
	PM_{10}	Traffic Sampling Gravimetric method from Air and Exhaust Air Monitoring and Analysis Method (4th Edition) issued by Ministry of Environmental Protection in 2003	0.001 mg/m^3	0.15
	SO_2	Formaldehyde absorbing-pararosaniline spectrophotometry (HJ 482-2009)	0.007-0.667 mg/m^3	0.15
	NO_x (NO_2)	N-(1-naphthyl)ethylene diamine dihydrochloride spectrophotometric method (HJ479-2009)	0.024-2.0 mg/m^3	0.12
Noise	Equivalent Continuous A Sound (Leq)	Acoustimeter Method (GB12524-90)	0.5	60/55 (day);
				50/45 (night)[2]
Surface water	pH[a]	Glass electrode method (GB6920-86)	0.02 pH	6-9[3]
	COD_{Mn} [a]	Permanganate index (GB11914-89)	0.5 mg/L	10
	Petroleum [a]	Infrared spectra photograph (HJ 637-2012)	0.01 mg/L	0.5
	SS [a]	Gravimetric method (GB11901-89)	4 mg/L	250
	Fecal coliforms[a]	Manifold zymotechnics and filter membrane (HJ/T 347-2007)	10 no./L	20000
	DO[b]	Iodometry (GB7489-87)	0.2 mg/L	3
	COD_{cr} [b]	Permanganate index (GB11914-89)	10 mg/L	30
	NH_3-N[b]	Nessler's reagent spectrophotometric method (HJ535-2009)	0.05 mg/L	1.5
	anionic	Methylene blue spectrophotometric	0.05 mg/L	0.3

Media	Monitoring Parameter	Method (Standard No.)	Detection Limit	Standard Limit
	surfactants [b]	method(GB7494-87)		
	BOD_5[c]	Dilution and inoculation test (HJ505-2009)	2 mg/L	6
	TN [c]	Alkaline potassium persulfate digestion ultraviolet spectrophotometry (HJ 636-2012)	0.05 mg/L	1.5
	TP [c]	Ammonium molybdate spectrophotometric method(GB11893-89)	0.01 mg/L	0.3
	As [c]	Diethyl dithio carbamic acid-Ag Spectrophotometry (GB7485-87)	0.007 mg/L	0.02
	Cd[c]	Atomic absorption spectrophotography (GB7467-87)	0.001 mg/L	0.005

Notes:

[1] All the air parameters are Grade II ambient air standard (daily average).

[2] Grade II and I standard, respectively (Grade I applying to the suburb area).

[3] All the water parameters are Class IV standard, as project river quality for all rivers within the project have Class IV protection target.

[a] Original water parameters in the EMP table 5

[b] Additional water parameters required by EMP Tables 7 & 8.

[c] Additional surface water monitoring parameters required in the approved Chinese Project EIA document.

Table 6.5- Environmental Reporting Plan

Report	From	To	Frequency of Reporting
A. Construction Phase			
Progress reports	Contractor/CSCs	LPMOs	Monthly
Environmental impact monitoring reports	Local EMSs	LPMOs, PIUs	Quarterly
EMP monitoring and progress report	LPMOs, PIUs	CPPMO	Quarterly
EMP monitoring and progress report	CPPMO, LIEC	ADB	Semi-annually
External verification report	EEM	CPPMO, LPMOs, PIUs, ADB	Annually
Environmental acceptance monitoring and audit reports	Licensed institute	City/county EPBs, CPPMO, IAs, PIUs, ADB	Within three month after component completion

32. Environmental Monitoring Performed by Environmental Monitoring Station:

A. Chuxiong Prefecture Environmental Monitoring Station (CPEMS) was retained to conduct the existing environmental monitoring, environmental impact monitoring. In accordance with EMP monitoring program, a detail environmental monitoring plan was developed by the Chuxiong prefecture EMS with the help from LIEC.

B. Environmental monitoring for existing environmental conditions of project sites in Chuxiong city, Wuding County and Lufeng County were carried out by CPEMS in order to gain an understanding of the background information in accordance with the EMP monitoring program, meanwhile considering the monitoring platform at the prefecture level superior to the County level.

C. Prior to commencement of site construction activities, CPEMS carried out existing environmental condition monitoring which covered air, noise and surface water quality in Chuxiong Road construction site, Wuding site, Chuxiong River Enhancement site and Lufeng site on 10th-12th November, 2015, 2nd-4th December 2015, 17th -22nd February, 2016, and 20th-23rd September, 2016, respectively. The requirements of monitoring parameters, sampling sites and frequency are listed in table 6.1. The first two results have been discussed in the 1st semi-annual environmental monitoring report (EMR); the third one has been discussed in the 2nd semi-annual EMR; the fourth one will be discussed in section 6.2.

D. During the construction period from January to June, CPEMS carried out impact monitoring which covered air, noise and surface water quality in Chuxiong Road construction site and Wuding site. The first quarterly impact monitoring was implemented on 23rd-25th February and 8th-13th March, 2016 in Chuxiong and Wuding respectively. The second quarterly impact monitoring was implemented on 21st -23rd June and 24th -29th May, 2016 in Chuxiong and Wuding respectively. The requirements of monitoring parameters, sampling sites and frequency are listed in table 6.2. The monitoring results have been discussed in the 2nd semi-annual EMR.

E. During this report period, impact monitoring was only carried out in Wuding site by CPEMS for no construction activities in Chuxiong site in the third quarter, 2016; and CCX1 mobilized in December, CLFR1 mobilized in November 2016. The third and fourth quarterly impact monitoring was implemented on 20th -23rd September 2016 and on 21st -24th November 2016 in Wuding site respectively. The monitoring results will be discussed in section 6.4.

33. **Environmental Monitoring Performed by Construction Supervision Company:** During this reporting period, two CSCs has been involved in the internal environmental monitoring, namely Kunming Construction Consulting & Supervising Co. Ltd. and Yunnan Urban Construction Consulting & Supervising Co. Ltd. Kunming Construction Consulting & Supervising Co. Ltd. supervised the performance of contractors of CCX1, CCX4, CWD1, CWD2, CWD3, CWD4-1 and CWD4-2; and Yunnan Urban Construction Consulting & Supervising Co. Ltd. supervised the performance of contractor of CLFR1. According to requirement of EMP monitoring program as outlined in table 6.2 & table 6.3, CSCs need to do weekly visual inspection on dust mitigation measures (water spraying, cover transport

vehicles etc.), on maintenance of vehicles and construction equipment, for waste management activities at work-camps and construction waste at construction sites; they do monthly visual inspection on work camp hygiene and safety, availability of clean water and emergency response plans; they do quarterly visual inspection on slope stability, topsoil stockpile and rehabilitation of construction sites, on compensatory planting and re-vegetation of borrow pits, spoil disposal sites and construction sites; and they do random visual inspection on soil erosion intensity and re-vegetation after rainstorm. The CSCs have implemented weekly, monthly and quarterly visual inspection and prepared the monthly progress reports since the contractors mobilized.

34. **Environmental Monitoring Performed by Construction Contractor:** During the reporting period, the construction contractor of CLFR1 conducted one surface water internal monitoring on 24th -26th December 2016, according to the requirement of EMP. The monitoring was awarded to Yunnan Fangyuan Technical Co. Ltd which is a non-governmental third party impartial inspection agency with China Metrology Accreditation (CMA) (Certification No: 2012250143U), and Grade B Monitoring Qualification Certificate issued by Yunnan Environmental Protection Department. The lab management and operation in Yunnan Fangyuan Technical Co.Ltd is strictly in accordance with international norms, and tests in the lab strictly follow the latest national accreditation standards. The monitoring report from the lab can be credible. The result of the 1st monitoring report will be discussed in the section 6.3.

6.2 Summary and Assessment of Monitoring Results of Lufeng urban infrastructure components (Existing condition)

35. CPEMS was retained to perform environmental sampling and monitoring for all media in Lufeng County project and reported monitoring results to PIUs accordingly. Existing monitoring in Lufeng County was undertaken on 19th -21st July 2016 covering air, noise and surface water quality. Sample locations include 4 sites for air, 13 sensitivity receptors for noise and 8 sites for surface water listed in the table 6.6. The existing monitoring results of 25 sites are provided by CPEMS (see APPENDIX I).

Table 6.6- Sampling locations for air, noise and water quality in Lufeng County project

No	Type	Name	Longitude	Latitude	Elevation
			(°′″)	(°′″)	（m）
No.1	Air	禄丰职中 Lufeng Vocational Middle School	102°04′13.22″	25°09′34.45″	1575
No.2		官洼小区 Guanwa Xiaoqu	102°03′48″	25°10′16.87″	1586
No.3		上营三组 Shangying Sanzu	102°04′30.91″	25°10′39.37″	1609
No.4		禄丰一中 Lufeng No.1 Middle School	102°04′40.49″	25°09′42.24″	1583
No.5	Noise	官洼小区 Guanwa Xiaoqu	102°03′48″	25°10′15″	1578
No.6		禄丰职中 Lufeng Vocational Middel School	102°04′14″	25°09′35″	1589
No.7		厂房村 Changfang Village	102°04′03″	25°09′37″	1567
No.8		庄科村 Zhuangke Village	102°04′03″	25°10′11″	1568

No	Type	Name	Longitude (°′″)	Latitude (°′″)	Elevation （m）
No.9		旧学村 Jiuxue Village	102°03′42″	25°09′32″	1574
No.10		西山村 Xishan Village	102°03′51″	25°09′34″	1580
No.11		金澜半岛 Jinlan Penisula	102°03′51″	25°09′14″	1570
No.12		上营 Shangying	102°04′32″	25°10′27″	1586
No.13		大北厂 Dabeichang	102°04′24″	25°10′07″	1584
No.14		小北厂 Xiaobeichang	102°04′27″	25°09′50″	1569
No.15		禄丰一中 Lufeng No.1 Middle School	102°04′42″	25°09′40″	1590
No.16		松园中学 Songyuan Middle School	102°04′52″	25°09′39″	1590
No.17		秦家营 Qingjiaying	102°04′35″	25°09′36″	1565
No.18	Surface water	东河河道治理起始端上游 50 米 50m upper-stream of construction activities on East river	102°05′07″	25°09′30″	1573
No.19		东河汇入西河交叉口西河上游 50 米 50m upper-stream West river intersection of East river and West river	102°03′58″	25°09′38″	1566
No.20		西河河道治理起始端上游 50 米 50m upper-stream of construction activities on West river	102°04′06″	25°10′31″	1581
No.21		西河河道治理末端下游 100 米 100m down-stream of construction activities on West river	102°03′35″	25°08′54″	1568
No.22		1 号路与西河交叉处上游 50 米 50m upper-stream intersection of West river and 1 Road	102°04′06″	25°10′31″	1581
No.23		1 号路与西河交叉处下游 100 米 100m down-stream intersection of West river and 1 Road	102°04′03″	25°10′27″	1577
No.24		2 号路与西河交叉处上游 50 米 50m upper-stream intersection of West river and 2 Road	102°03′54″	25°10′20″	1575
No.25		2 号路与西河交叉处下游 100 米 100m down-stream intersection of West river	102°03′54″	25°10′14″	1573

No	Type	Name	Longitude (°′″)	Latitude (°′″)	Elevation （m）
		and 2 Road			

36. Air Quality Monitoring

A. It is difficult to detect the upwind and downwind because the wind direction changes so often influenced by locally topography. So four sampling sites from northern, eastern, southern and western boundary of the construction site were selected; the location was illustrated in the table 6.6. The average 24hours concentration of four parameters (TSP, PM10, SO2, and NO2) over three consecutive days at the four sites was displayed in the Figure 6.1. According to the Ambient Air Quality Standard (GB3095-2012), standard average 24hours concentration of SO_2, NO_2, TSP and PM_{10} are 150ug/m^3, 80ug/m^3, 300ug/m^3, and 150ug/m^3 respectively, for Grade II level. The monitoring values of four parameters were less the corresponding standard value at the four sites.

B. Conclusion: During the pre-construction phase, ambient air quality at the four construction sites meet the Grade II standard（GB3095-2012）, in terms of average 24hours concentration of SO_2, NO_2, TSP and PM_{10}.

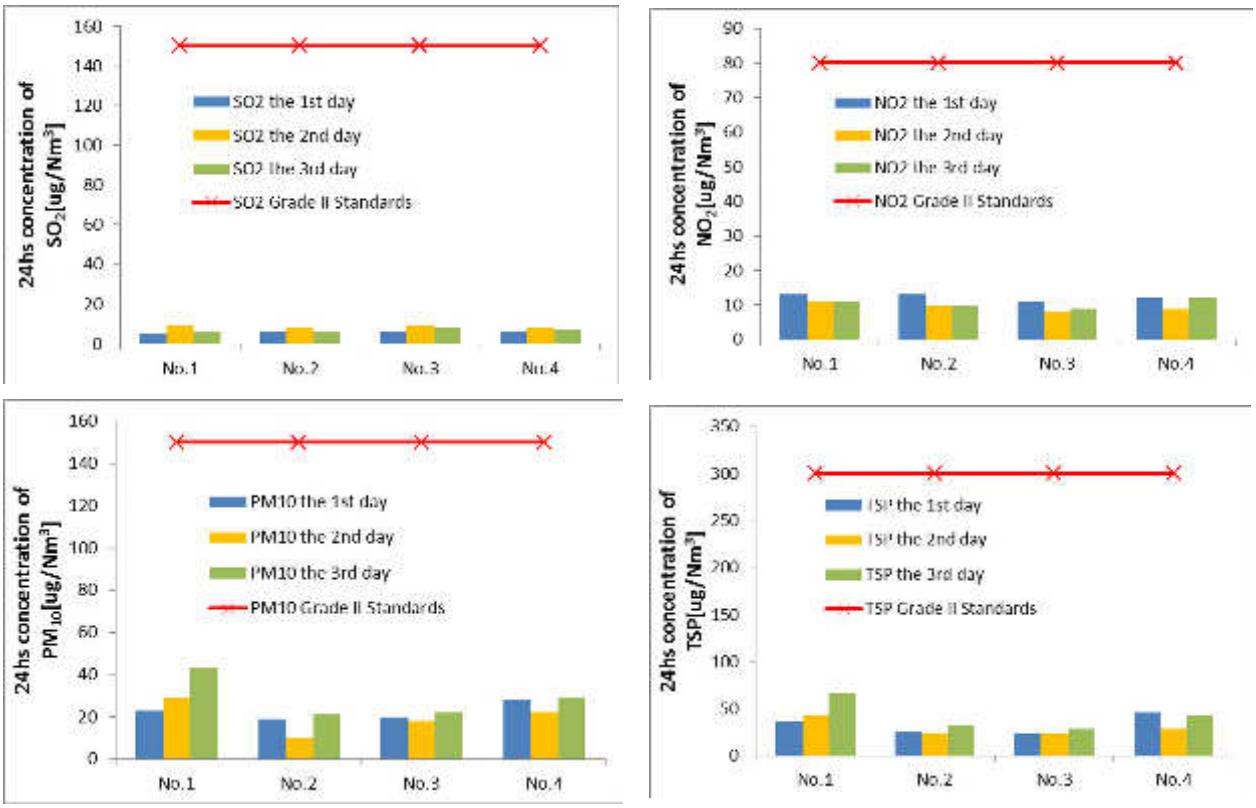


Figure 6.1 Comparison of the mean 24hours concentration of four parameters at four sites with standard values of Grade II level in Wuding County (pre-construction phase)

37. Noise Level Monitoring

A. 13 sensitive receivers have been detected in EIA report for Lufeng infrastructure components. The location of 13 sites has been illustrated in the table 6.6. The monitoring noise in the daytime and in the night over 2 consecutive days at 13 sensitive receivers was shown in Figure 6.2. According to Environmental Quality Standard for Noise (GB3096-2008), the standard noise in the daytime and in the night-time is 60 dBA and 50dBA respectively, for Class II level. In the daytime, the noise at 13 sensitive receivers ranged between 42dBA and 59dBA; in the night-time, the values ranged between 40dBA and 50dBA. The monitoring values at 13 sensitive receivers were less the corresponding standard value both in the daytime and in the night.

B. Conclusion：During the pre-construction phase, the noise environmental quality at the 13 sensitive receivers around the construction site meet the standard of class II environmental function zone (GB3096-2008).

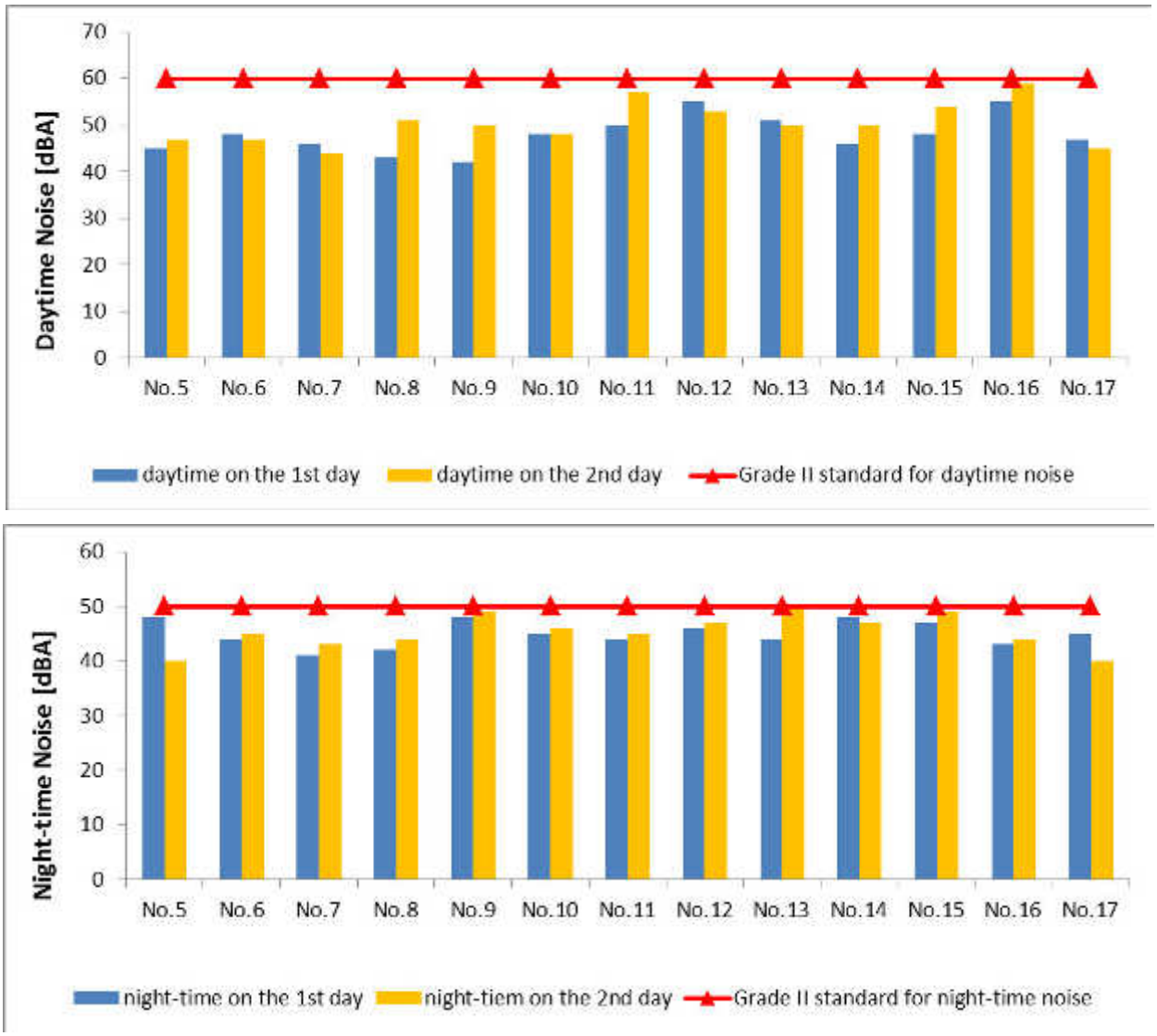


Figure 6.2 Comparison of noise in the daytime and in the night-time at 13 sensitive receivers with standard values for Grade II level in Lufeng County (pre-construction phase)

38. Surface Water Quality Monitoring

A. River enhancement will be constructed in East and West River, and two bridges will be constructed across West River in Lufeng County. Eight sites (No18 - No25 in the table 6.6) were selected as water sampling sites for water quality assessment. 14 parameters were tested in the lab for river enhancement sites (No.18-No.21) and 12 parameters were tested for the later four sites (No.22-No.25) as requirement in the table 6.1. The range of monitoring values over three consecutive days was listed in the table 6.7-1 and table 6.7-2. According to the Yunnan Environmental Functional zoning, the surface water quality at the construction sites should be up to grade IV (*Environmental Quality Standards for Surface Water*, GB3838-2002). The monitoring results showed the concentration of TN and fecal coliforms is beyond the grade IV standard (see the bold value in the table 6.7), and the maximum value of TN is up to 2.26mg/l at the No23 site.

B. Conclusion: Before Construction Phase, the surface water quality at the 8 sites all exceeded the Grade IV level. The water pollution was indexed by TN and fecal coliforms.

Table 6.7-1 Comparison of daily concentration of 14 parameters and standard values for Grade IV at river enhancement sites

Parameters	Unit	Standard (Grade IV)	No.18	No.19	No.20	No.21
pH		6-9	8.25-8.28	7.68-7.74	7.63-7.76	7.91-7.99
DO	mg/l	≥3	6.5-6.9	5.1-5.2	5.9-6.2	5.7-6.0
SS	mg/l	-	14-57	9--59	14-56	15-50
CODcr	mg/l	≤30	10.8-11.2	12.3-16.6	14.8-15.8	13.2-15.4
oil	mg/l	≤0.5	0.01L-0.01	0.01L-0.01	0.01-0.02	0.01L-0.01
anionic surfactants	mg/l	≤0.3	0.07-0.09	0.05-0.08	0.05L-0.08	0.05L-0.06
NH3-N	mg/l	≤1.5	0.264-0.386	0.362-0.409	0.257-0.293	0.355-0.422
CODmn	mg/l	≤10	3.18-3.5	3.41-3.74	3.11-3.83	3.53-3.85
BOD5	mg/l	≤6	0.8-1.0	1.1-1.3	1.0-1.3	1.0-1.3
TN	mg/l	≤1.5	1.37-**1.67**	**1.8-1.98**	**1.89-2.04**	**1.57-2.18**
TP	mg/l	≤0.3	0.059-0.114	0.107-0.158	0.1-0.144	0.107-0.138
Fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
As	mg/l	≤0.1	0.0011-0.0015	0.001-0.0014	0.001-0.0019	0.001-0.0015
Cd	mg/l	≤0.005	0.0001L	0.0001L	0.0001L	0.0001L

Table 6.7-2 Comparison of daily concentration of 12 parameters and standard values for Grade IV at bridge crossing river sites

Parameters	Unit	Standard (Grade IV)	No.22	No.23	No.24	No.25
pH		6-9	7.63-7.76	7.65-7.79	7.62-7.74	7.69-7.74
DO	mg/l	≥3	5.9-6.2	5.7-6.2	5.6-5.8	5.1-5.8
SS	mg/l	-	14-56	16-83	15-56	20-70
CODcr	mg/l	≤30	14.8-15.8	12.4-16.2	14.7-17.9	11.0-15.8
oil	mg/l	≤0.5	0.01-0.02	0.01L-0.02	0.01L-0.01	0.01-0.02

Parameters	Unit	Standard (Grade IV)	No.22	No.23	No.24	No.25
anionic surfactants	mg/l	≤0.3	0.05L-0.08	0.05L-0.08	0.05L-0.08	0.05L-0.07
NH3-N	mg/l	≤1.5	0.257-0.293	0.411-0.468	0.347-0.398	0.445-0.486
CODmn	mg/l	≤10	3.11-3.83	3.75-4.29	2.74-3.53	3.45-3.69
BOD5	mg/l	≤6	1.0-1.3	1.0-1.3	1.1-1.3	1.3-1.6
TN	mg/l	≤1.5	**1.89-2.04**	**2.0-2.26**	**1.4-1.79**	**1.86-2.19**
TP	mg/l	≤0.3	0.1-0.144	0.141-0.165	0.11-0.148	0.141-0.144
Fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**

6.3 Summary and Assessment of Monitoring Results of Lufeng river enhancement component (Internal Monitoring by the Contractor)

39. The 1st internal monitoring of East-West River was conducted on 24th -26th December, 2016 by construction contractor. The table 6.3 described the requirement on parameters and frequency. According to updated EMP, water sampling was taken from 6 sites, marking with 1#, 2#, 3#, 4#, 5#and 6#, in which 1#, 2#, 3#, and 6# are corresponding to No.18, No.19, No.20 and No.21 in the table 6.6 (existing condition); and two sites were added (4#: 50m upper-stream East river intersection of East river and West river ; 5#: 100m down-stream West river intersection of East river and West river).The internal surface water monitoring report was provided by Yunnan Fangyuan Technical Co. Ltd(see APPENDIX II). And the range of monitoring values over three consecutive days at 6 sites is summarized in the table 6.8. The monitoring results illustrated the concentration of 14 monitoring parameters at 1#, 2#, and 4# was accordance with Grade IV (*Environmental Quality Standards for Surface Water*, GB3838-2002), and the value at three sites (3#, 5# and 6#) exceeded the Grade IV; the concentration of TN at 5# and 6# sites was greater than 1.5mg/l, the maximum concentration of TN was 1.83mg/l at 6# site; and the concentration of Fecal coliforms at 3#, 5# and 6# sites was greater than 20000 MPN/L, and the maximum concentration of Fecal coliforms was 4600 MPN/L at 6# site.

Table 6.8 Comparison of daily concentration of 14 parameters and standard values for Grade IV at 6 sites in East-west River

Parameters	Monitoring sites						Standard
	1#(No.18)	2#(No.19)	3#(No.20)	4#	5#	6#(No.21)	Grade IV
pH	7.82-7.92	7.98-8.02	8.36-8.46	7.94-7.99	8.36-8.44	8.45-8.58	**6~9**
oil （mg/L）	0.02	0.02-0.03	0.01-0.02	0.01-0.02	0.02	0.04-0.05	**≤0.5**
TP （mg/L）	0.05-0.06	0.06-0.07	0.05-0.06	0.03-0.04	0.07-0.09	0.08-0.10	**≤0.3**
anionic surfactants （mg/L）	0.259-0.288	0.220-0.263	0.172-0.202	0.222-0.268	0.266-0.293	0.278-0.297	**≤0.3**
NH_3-N （mg/L）	0.238-0.257	0.189-0.197	0.524-0.540	0.360-0.382	0.692-0.706	0.724-0.742	**≤1.5**
TN	0.958-1.04	0.652-	1.39-1.42	1.22-1.28	**1.59-1.60**	**1.75-1.83**	**≤1.5**

Parameters	Monitoring sites						Standard
	1#(No.18)	**2#(No.19)**	**3#(No.20)**	**4#**	**5#**	**6#(No.21)**	Grade IV
（mg/L）		0.690					
COD_{mn} （mg/L）	1.8-2.3	1.9-2.0	2.1-2.4	2.3-2.4	2.1-2.8	2.6-3.0	**≤10**
COD_{cr} （mg/L）	<10	<10	10.0-13.0	<10-10	23-28	17-26	**≤30**
BOD_5 （mg/L）	0.8-1.7	1.0-1.3	2.2-3.0	2.1-2.5	5.1-5.9	3.4-5.6	**≤6**
DO （mg/L）	8.7-8.8	8.7-8.8	8.3-8.5	8.5-8.7	7.6-7.7	7.8-7.9	**≥3**
SS （mg/L）	8.0-10.0	19-24	6.0-9.0	5.0-8.0	21.0-26.0	10.0-13.0	**-**
Fecal coliforms （MPN/L）	700-940	340-490	**2600-3300**	460-630	**2800-3500**	**4300-4600**	**≤20000**
Cd （mg/L）	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**≤0.005**
As（μg/L）	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**≤0.1**

40. Conclusion: According to the existing condition monitoring results, the water quality at 1#, 2#, 3# and 6# sites was exceeded the Grade IV(GB3838-2002) in terms of TN and Fecal coliforms; the internal monitoring showed that the water quality at 3#, 5# and 6# sites was exceeded the Grade IV(GB3838-2002) in terms of TN and Fecal coliforms. The down-stream of West River is surrounded by agricultural land. Comparison the existing condition monitoring with internal monitoring results, the surface water quality at 3#, 5# and 6# sites was mainly polluted by the agricultural land and the effect of river enhancement construction on the river surface water quality was insignificant during this reporting period.

6.4 Summary and Assessment of Monitoring Results of Wuding County urban infrastructure components

41. CPEMS was retained to perform environmental sampling and monitoring for all media in Wuding county project and reported monitoring results to PIUs accordingly. The 3rd quarterly impact monitoring was conducted on 20th-23rd September 2016, covering air, noise and surface water quality. Sampling locations were listed in the table 6.9, including 4 boundary sites(No.1 to No.4) and 8 sensitive receivers(No.5 to No.12) for noise and air monitoring, 2 sites for water quality of No.4 Bridge crossing Wulong River (No.21 and No.22). The 3rd impact monitoring results of 14 sites are provided by CPEMS (see APPENDIX III).

42. The 4th quarterly impact monitoring was conducted on 21st -24th November 2016 by CPEMS, covering air, noise and surface water quality. Sampling locations were listed in the table 6.9, including 4 boundary sites(No.1 to No.4) and 5 sensitive receivers(No.5, No.6, No.8,

No.9 and No.11) for noise and air monitoring, 12 sites for water quality of 6 bridges crossing Wulong River and Caiyuan River (No.15 to No.26). The 4th impact monitoring results of 21 sites are provided by CPEMS (see APPENDIX IV).

Table 6.9 List of sampling locations for air, noise and water quality in Wuding County project

NO.	Type	Name	Longitude (° ′ ″)	Latitude (° ′ ″)	Note
1	Air/Noise	武定县政协 Wuding Chinese People's Political Consultative Conference	102° 24′ 18″	25° 32′ 32″	West
2		北街社区院内 Beijie Community	102° 24′ 41″	25° 32′ 11″	South
3		旧城社区院内 Jiucheng Community	102° 24′ 4″	25° 32′ 38″	East
4		西和村委会院内 Xihe Village Committee	102° 24′ 29″	25° 32′ 53″	North
5		西和村委会 Xihe Village Committee	102° 24′ 30″	25° 32′ 52″	sensitive receiver
6		上旧城 Shangjiu Cheng	102° 24′ 49″	25° 32′ 21″	sensitive receiver
7		下旧城 Xiajiu Cheng	102° 24′ 55″	25° 32′ 34″	sensitive receiver
8		武定县中医院 Wuding Chinese Medicine Hospital	102° 24′ 38″	25° 32′ 07″	sensitive receiver
9		思源实验中学 Siyuan Shiyan Middle School	102° 24′ 47″	25° 32′ 15″	sensitive receiver
10		荣合小区 Ronghe Community	102° 24′ 38″	25° 32′ 12″	sensitive receiver
11		白邑村 Baiyi Village	102° 25′ 06″	25° 32′ 43″	sensitive receiver
12		罗婺家园大酒店 Luowu home Hotel	102° 25′ 30″	25° 32′ 28″	sensitive receiver
13	Water	乌龙河治理起点上游 50 米 50m upper-stream of River rehabilitation start point	102° 24′ 2″	25° 33′ 12″	River rehabilitation upper-stream 50m
14		乌龙河治理末端下游 100 米 100m down-stream of River rehabilitation end point	102° 25′ 10″	25° 32′ 38″	River rehabilitation down-stream 100m
15		CWD3（城北路）跨域乌龙河 1 号中桥上游 50 米 50m upper-stream of project bridge (No1 medium bridge)	102° 24′ 18″	25° 32′ 56″	project bridge upper-stream 50m
16		CWD3（城北路）跨域乌龙河 1 号中桥下游 100 米 100m down-stream of project bridge (No1 medium bridge)	102° 24′ 19″	25° 32′ 51″	project bridge down-stream 100m

NO.	Type	Name	Longitude (° ′ ″)	Latitude (° ′ ″)	Note
17		CWD4-2（牡丹路）跨域乌龙河 2 号中桥上游 50 米 50m upper-stream of project bridge (No2 medium bridge)	102° 24′ 18″	25° 32′ 44″	project bridge upper-stream 50m
18		CWD4-2（牡丹路）跨域乌龙河 2 号中桥下游 100 米 100m down-stream of project bridge (No2 medium bridge)	102° 24′ 20″	25° 32′ 33″	project bridge down-stream 100m
19		CWD2(武续路)跨越乌龙河 3 号中桥上游 50 米 50m upper-stream of project bridge (No3 medium bridge)	102° 24′ 21″	25° 32′ 29″	project bridge upper-stream 50m
20		CWD2(武续路)跨越乌龙河 3 号中桥下游 100 米 100m down-stream of project bridge (No3 medium bridge)	102° 24′ 20″	25° 32′ 29″	project bridge down-stream 100m
21		CWD1（北城大道）跨越乌龙河 4 号中桥上游 50 米 50m upper-stream of project bridge (No4 medium bridge)	102° 24′ 31″	25° 32′ 18″	project bridge upper-stream 50m
22		CWD1（北城大道）跨越乌龙河 4 号中桥下游 100 米 100m down-stream of project bridge (No4 medium bridge)	102° 24′ 32″	25° 32′ 13″	project bridge down-stream 100m
23		CWD4-2(滨河路)跨越乌龙河 5 号中桥上游 50 米 50m upper-stream of project bridge (No5 medium bridge)	102° 24′ 43″	25° 32′ 15″	project bridge upper-stream 50m
24		CWD4-2(滨河路)跨越乌龙河 5 号中桥下游 100 米 100m down-stream of project bridge (No5 medium bridge)	102° 24′ 48″	25° 32′ 18″	project bridge down-stream 100m
25		CWD4-2（牡丹路）跨越菜园河菜园河中桥上游 50 米 50m upper-stream of project bridge (Caiyuanhe medium bridge)	102° 24′ 56″	25° 32′ 38″	project bridge upper-stream 50m
26		CWD4-2（牡丹路）跨越菜园河菜园河中桥下游 100 米 100m down-stream of project bridge (Caiyuanhe medium bridge)	102° 24′ 59″	25° 32′ 43″	project bridge down-stream 100m

43. Air Quality Monitoring

A. Air Quality at the construction boundary

- The hourly concentration of SO_2, NO_x and TSP (four times per day for 3 consecutive days, and one hour each time) at northern, eastern, southern and western boundary of the construction site in Wuding County for the 3rd quarterly and 4th quarterly impact monitoring in 2016 was illustrated in Figure 6.3, Figure 6.4 and Figure 6.5.
- The hourly concentration of SO_2 ranges between 0.008 mg/m^3 and 0.039 mg/Nm$^{3;}$ the hourly concentration of NO_x ranges between 0.005 mg/m^3 and 0.035mg/Nm^3; the hourly concentration of TSP ranges between 0.001 mg/m^3 and 0.822mg/Nm^3.
- According to *the Integrated Emission Standard of Air Pollutants* (GB16297-1996), standard maximum emission of hourly concentration of SO_2, NO_x, and TSP are 0.4mg/m^3,0.12 mg/m^3 and 1.0 mg/m^3 respectively. The monitoring values of three parameters at four sites were less than the standard maximum emission values (Figure 6.3, Figure 6.4 and Figure6.5).
- Conclusion: During the reporting period (the 3rd quarter and 4th quarter, 2016), the emission of air pollutants at the four boundary sites was accordance with the standard maximum emission values.

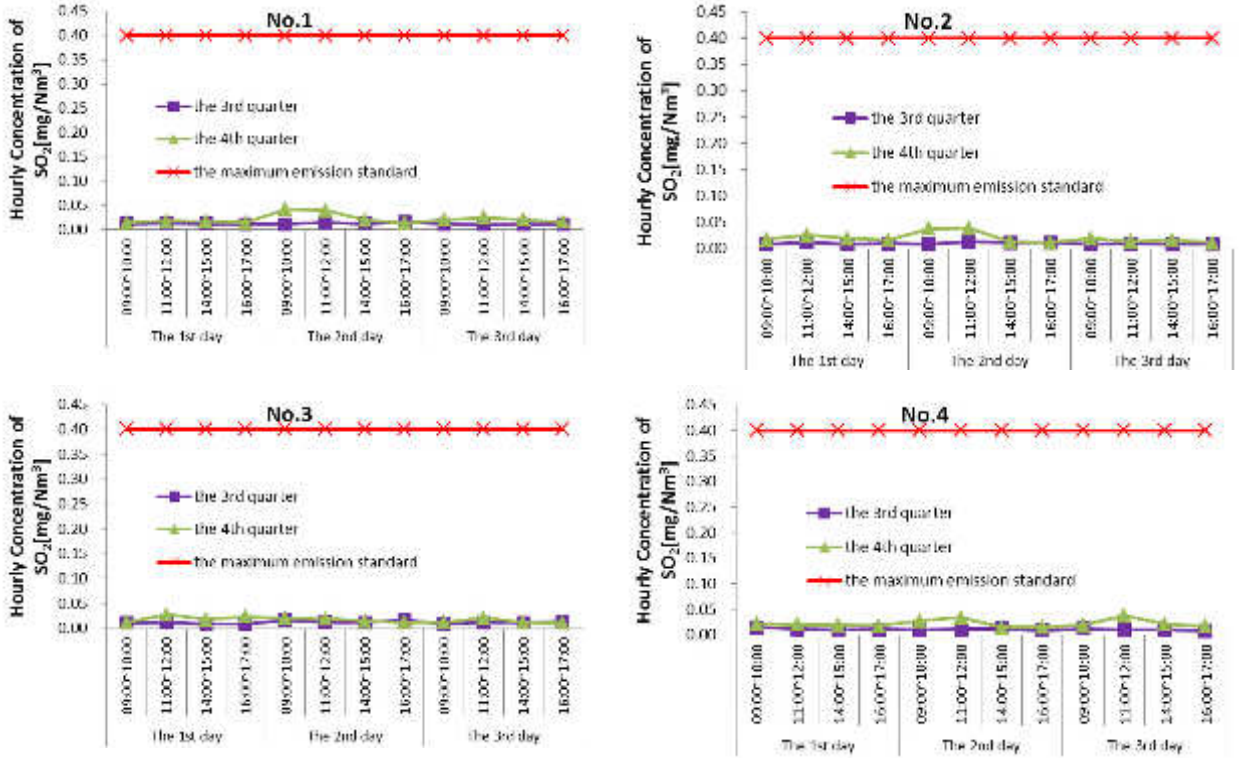


Figure 6.3 the hourly concentration of SO_2 at the boundary sites in Wuding County (July-December, 2016)

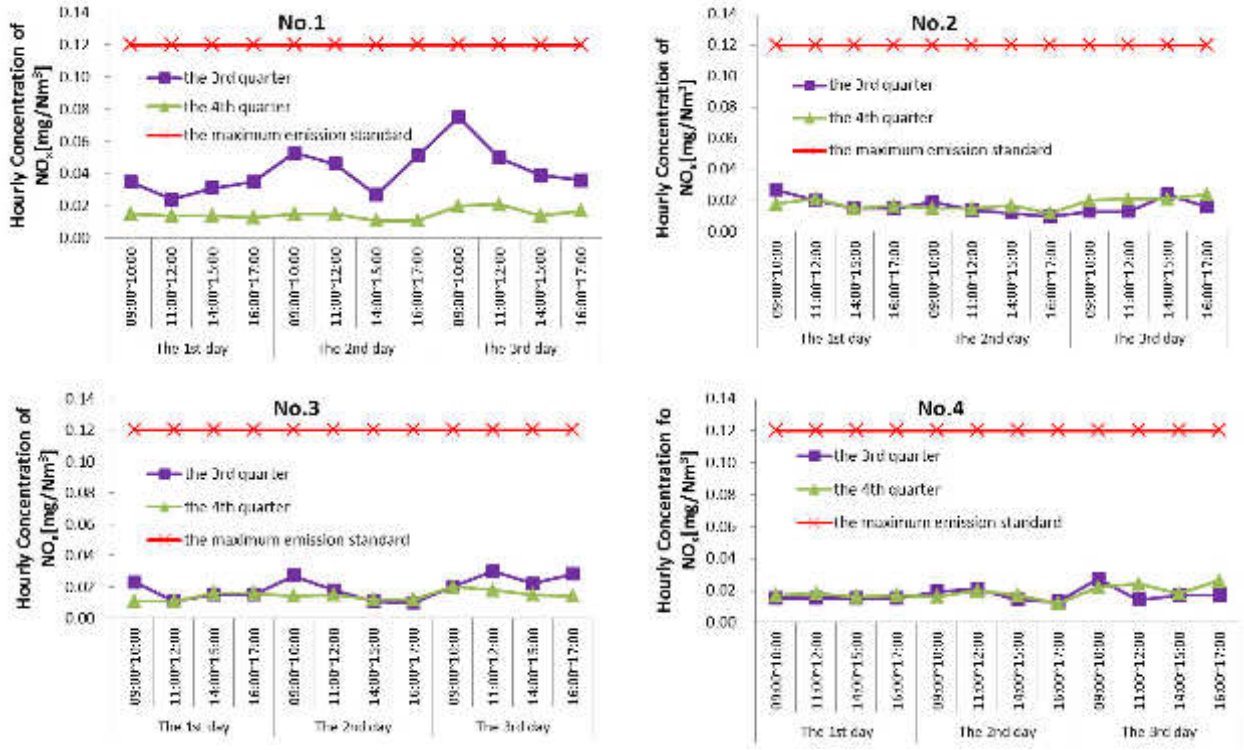


Figure 6.4 the hourly concentration of NOx at the boundary sites in Wuding County (July-December, 2016)

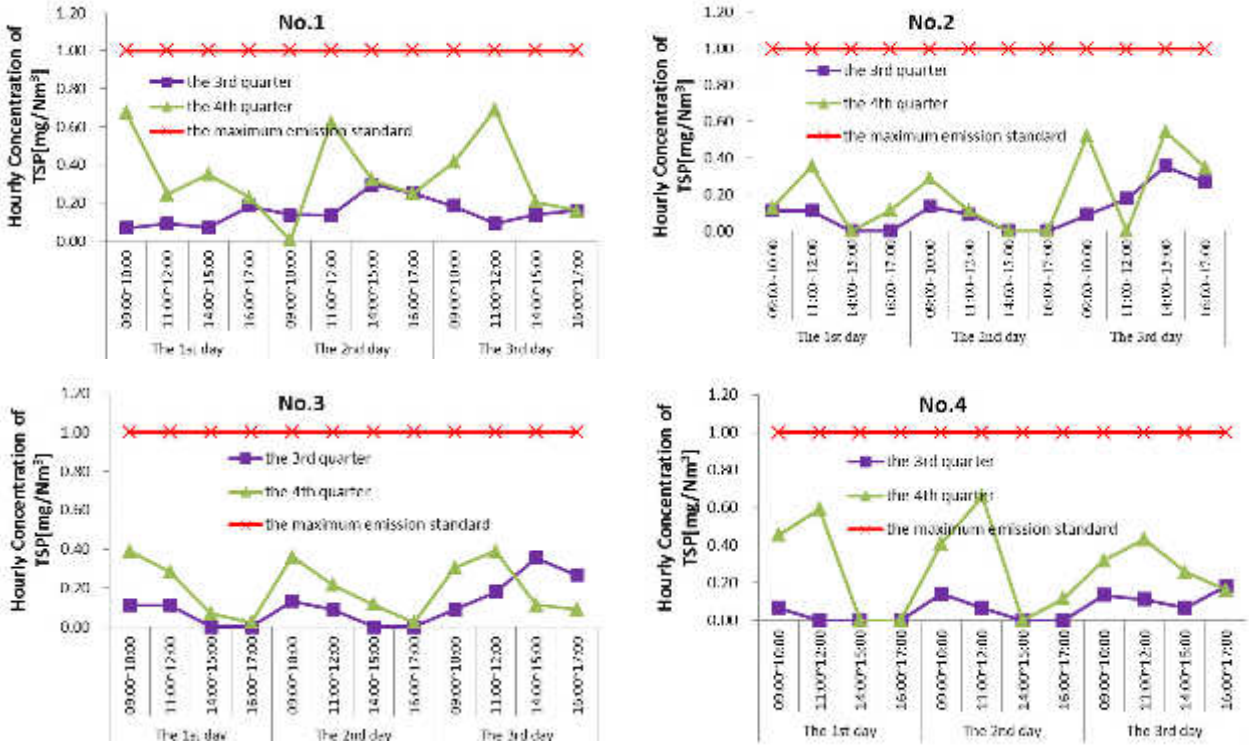
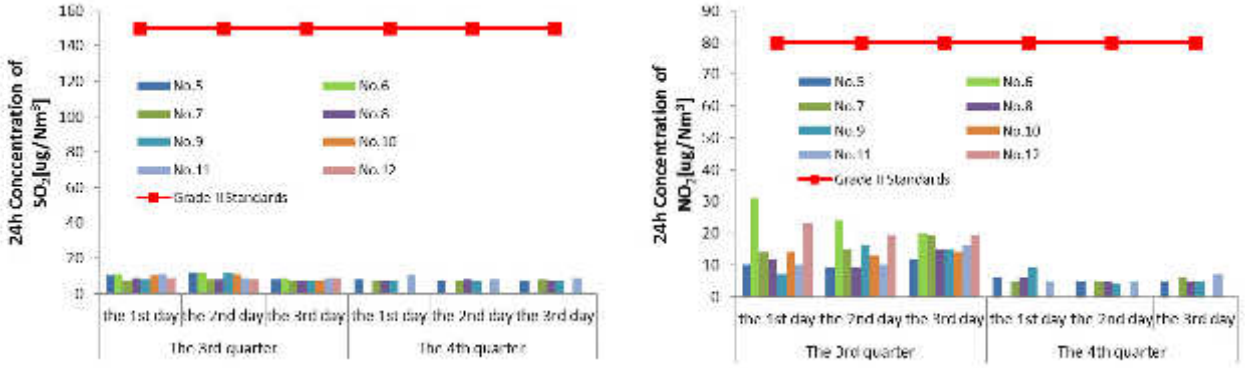


Figure 6.5 the hourly concentration of TSP at the boundary sites in Wuding County (July-December, 2016)

B. Air Quality at the sensitive receivers

- The sensitive receivers' adjustment: during the 4th quarter, 2016, 8 sensitive receivers were adjusted to 5 sites by CPEMS. Two sites (No.10 and No.12) were deleted for they are closer to traffic road than the construction sites, and two sites (No.6 and No.7) were combined into one site for they are one community.
- The average 24hours concentration of SO_2, NO_2, TSP and PM_{10} (24 hours over three consecutive days) at the sensitive receivers was illustrated in Figure 6.6 during the reporting period. According to the *Ambient Air Quality Standard* (GB3095-2012), standard average 24hours concentration of SO_2, NO2, TSP and PM_{10} are 150 ug/m^3, 80 ug/m^3, 300 ug/m^3 and 150ug/m^3 respectively, for Grade II level. From Figure 6.6, during the 3rd quarter (in September, 2016), the average 24hours concentration of SO_2, NO_2, TSP and PM_{10} at 8 sensitive receivers was less than the Grade II values; during the 4th quarter (in November, 2016), the average 24hours concentration of SO_2, NO_2 and TSP at 5 sensitive receivers was less than the Grade II values, and the average 24hours concentration of PM_{10} at 2 sites (No.8 and No.11) was greater than the Grade II value. The value of PM_{10} at No.8 exceeded by 8% on 24th November, and the values of PM_{10} at No.11 exceeded by 14% and 16.7% on 23rd and 24th November, respectively. Comparison the value of PM_{10} in September with the value in November, the value of PM_{10} in November was greater than the values in September, generally.
- Conclusion: The ambient air quality at 8 sensitive receivers was accordance with the Grade II level during the 3rd quarter, 2016; during the 4th quarter, the ambient air quality at 3 sensitive receivers was accordance with the Grade II level; and the ambient air quality at 2 sensitive receivers (No. 8 and No.11) was beyond the Grade II level in terms of the pollutants of PM_{10}.



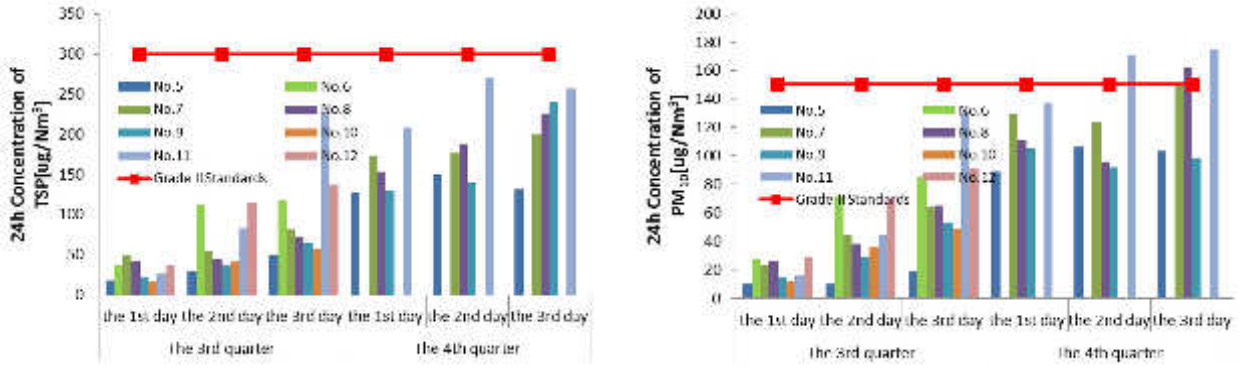


Figure 6.6 the average 24 hours concentration of SO_2, NO_2, TSP and PM_{10} at sensitive receivers in Wuding County (July to December, 2016)

C. Summary

- Air quality of the four boundary sites was less influenced by the road construction during the reporting period.
- The average 24hours concentration of PM_{10} at No.8 site (Wuding Chinese Medicine Hospital 武定县中医院) and No.11 site (Baiyi Village 白邑村) was greater than the Grade II level (GB3095-2012) during the 4th quarter in 2016 which indicated air quality at two sites maybe be influenced by the road construction. The two sensitive receivers are located nearby the constructing roads, and the monthly progress report from CSC stated that the water spraying mitigation measures have not been in place by the contractor of CWD1 in October and November, 2016. So the concentration of PM_{10} at the two sites in November was influenced by the construction dust. The water spraying mitigation measures should be strengthened during construction period, especially in dry season.

44. Noise Level Monitoring

A. Noise at construction boundary

- During the reporting period, the daytime noise and night-time noise (including the maximum night-time noise) over the consecutive two days at the four construction boundary sites in Wuding County was illustrated in Figure 6.7.
- According to *Construction Site Noise Emission Standards* (GB12523-2011), the emission limit daytime noise, night-time noise and the maximum night-time noise are 70 dB (A), 55 dB (A), and (55+15) dB (A), respectively. From Figure 6.7, the daytime noise at the four boundary sites was less than the emission limit value during the reporting period; the night-time noise at the three boundary sites (except No.1: Wuding Chinese People's Political Consultative Conference 武定县政协) was less than the emission limit value during the reporting period, and the night-time noise at No.1 was greater than the emission limit value by 4.9% -12.7% in the 3rd and 4th quarter, 2016; in terms of the maximum night-time noise, only two sites' value (No.2 and No.3) in the 3rd quarter was less than the emission limit value, the others were beyond the emission limit values by 1.4% - 24.2%.

- Conclusion: during the 3rd quarter, the noise environmental quality at the No.2 and No.3 was accordance with the *Construction Site Noise Emission Standards* (GB12523-2011); night-time noise and the maximum night-time noise at No.1 were beyond the standards; night-time noise at No.4 was beyond the standards. During the 4th quarter, noise at the four boundary sites was all beyond the *Construction Site Noise Emission Standards* (GB12523-2011); night-time noise and the maximum night-time noise at No.1 was beyond the standards; night-time noise at No.2, No.3 and No.4 was beyond the standards.

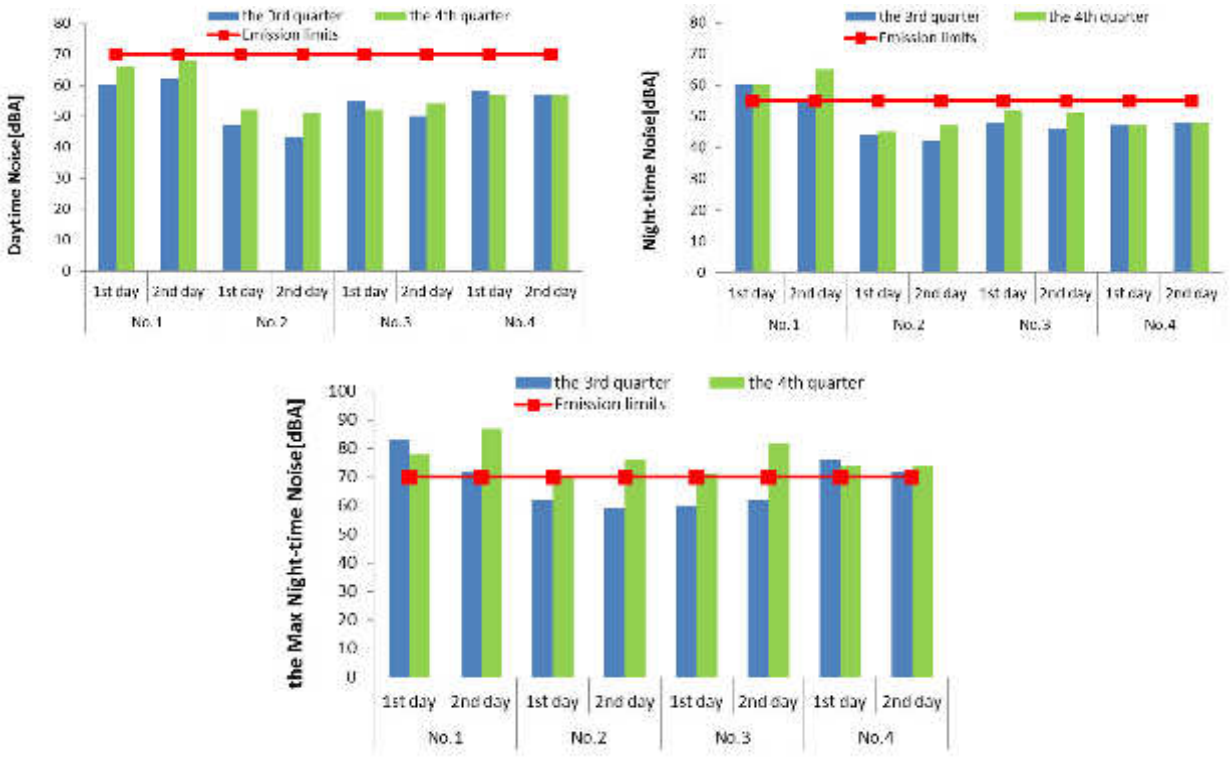


Figure 6.7 Noise at the construction boundary sites in Wuding County (July to December, 2016)

B. Noise at the sensitive receivers

- Sensitive receivers' adjustment: 9 sensitive receivers identified in EIA report for Wuding infrastructure and environmental improvement components were detected pre-construction phase. During the construction phase (in the 1st, 2nd and 3rd quarter, 2016), the 9 sensitive receivers was adjusted to 8 sensitive receivers by CPEMS, in which 3 sites were deleted for they were far away from the construction site, and 2 sites were added (No.9 and No.10). During the 4th quarter, 2016, as mentioned in air monitoring section, 8 sensitive receivers was adjusted to 5 sensitive receivers.
- The daytime noise and night-time noise at the sensitive receivers over two consecutive days for three phases (pre-construction, the 3rd quarter, and 4th quarter) were illustrated in Figure 6.8. The number of the sensitive receivers is 6, 8 and 5 for pre-construction phase, the 3rd quarter, and 4th quarter, respectively.
- Basing on *Environmental Quality Standard for Noise* (GB3096-2008), the standard daytime noise and night-time noise are 60 dB (A) and 50dB (A) respectively, for Grade

II level. From Figure 6.8, the daytime and night-time noise at No.12 (Luowu Home Hotel 罗婺家园大酒店) was greater than the Grade II level by 1.3-2.5% and by 9.4-16.4% during pre-construction phase; During the 3rd quarter, the daytime noise at No. 10 (Ronghe Community 荣合小区) was greater than the Grade II level by 1.7-3.3% , the night-time noise at No.10 and No.12 by 10-12% and by 4%; During the 4th quarter, the daytime noise at No.8 (Wuding Chinese Medicine Hospital 武定县中医院) was greater than the Grade II level by 6.7%, and the night-time noise at No.5 (Xihe Village Committee 西和村委会) , No.6 (Jiucheng Community 旧城市区) and No.8 was greater than the Grade II level by 8%, 4-6% and 8%, respectively.

- Conclusion: During the pre-construction phase, the noise at No.5, No.6, No.7, No.8 and No.11 was accordance with the Grade II level (GB3096-2008); and the noise at No. 12 was beyond the standards. During the 3rd quarter 2016, the noise at 6 sites (No.5-No.9, and No.11) was accordance with the Grade II level; the noise at 2 sites (No.10 and No.12) was beyond the standards. During the 4th quarter 2016, the noise at 2 sites (No.9 and No.11) was accordance with the Grade II level; and the noise at 3 sites (No.5, No.6 and No.8) was beyond the standards.

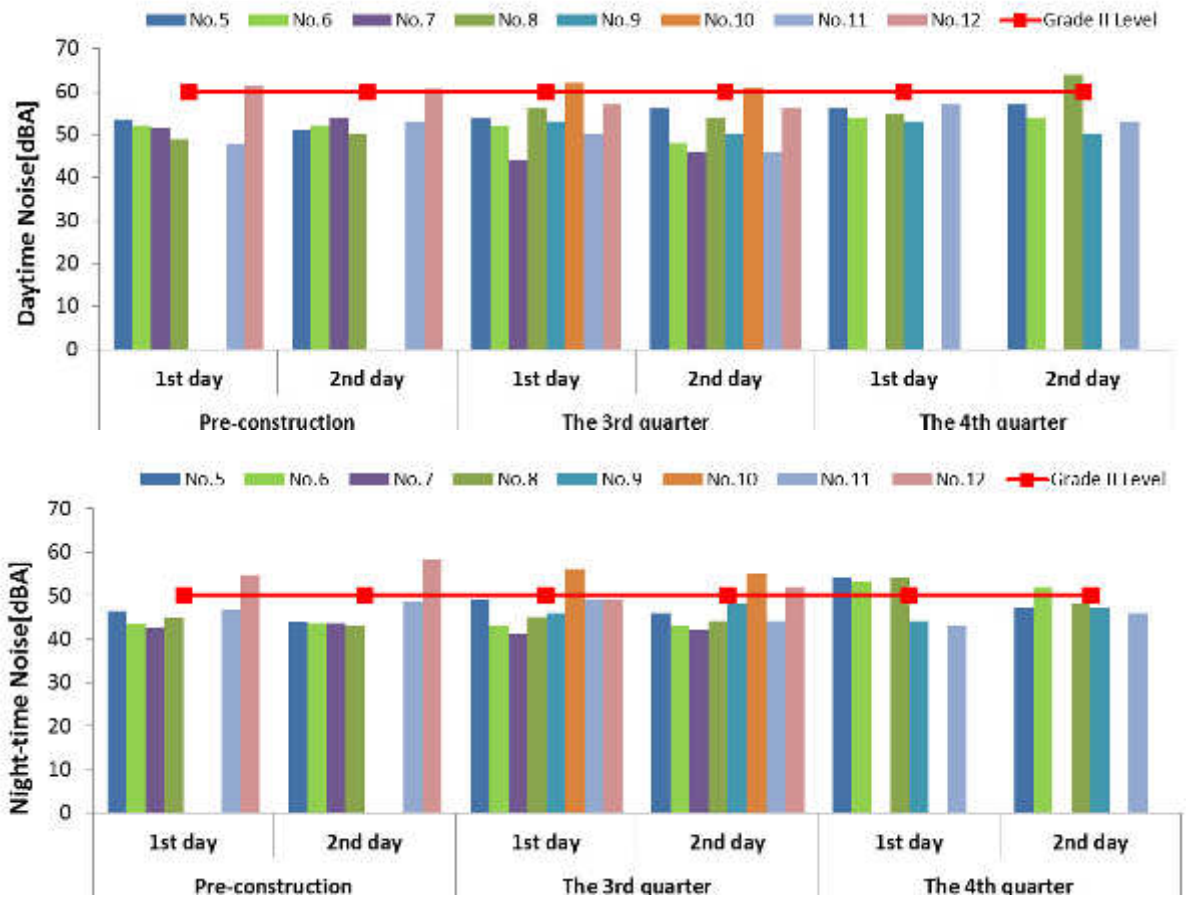


Figure 6.8 Noise at sensitive receivers in Wuding County during three phases (Pre-construction, the 3rd quarter, and the 4th quarter, 2016)

C. Summary

- Noise monitoring results at the construction boundary sites showed that the noise at No.1 and No.4 was beyond the Grade II level in the 3rd quarter 2016; and the noise at four boundary sites was beyond the standards in the 4th quarter 2016. During the 3rd quarter 2016, No. 1 and No.4 were far away from the construction site (only CWD1 was in construction during the 3rd quarter), and a main traffic road is beside the No.1, so the effect of road construction (CWD1) on the noise at the boundary sites was less. During the 4th quarter 2016, there were 5 road-contracts (CWD1, CWD2, CWD3, CWD4-1, and CWD4-2) being construction, the night-time noise and the maximum night-time noise at the four sites indicated that the noise at the boundary sites was possible influenced by the road construction at night.
- Noise monitoring results at the sensitive receivers showed 1) the effect of road construction on the noise at sensitive receivers was less during the 3rd quarter 2016 for the noise at No.12 was also beyond the standards in pre-construction phase, and the location of No.10 and No.12 are far away from the construction site (CWD1); 2) the noise at 3sites (No.5, No.6 and No.8) was possible influenced by the road contracts construction during the 4th quarter 2016 for the location of 3 sensitive receivers is close to the 5 constructing-roads.

45. Surface Water Quality Monitoring

A. Sampling sites: During the 3rd quarter 2016, one bridge (No.4 medium bridge) was to be built crossing the Wulong River in terms of CWD1, and Water quality at two sites (No. 21and No.22) was detected in the lab. During the 4th quarter 2016, six bridges crossing Wulong River and Caiyuan River were to be built, namely No.1 medium bridge, No.2 medium bridge, No.3 medium bridge, No.4 medium bridge, and No.5 medium bridge and Caiyuanhe medium bridge. Water quality at 12 sites (No.15- No.26) was detected in the lab.

B. The concentrations range of 12 parameters over three days at the upper-stream and down-stream of 6 bridges were listed in the table 6.10 - table 6.15, following with the standard values for grade IV level from *Environmental Quality Standards for Surface Water* (GB3838-2002), including pre-construction and the reporting period. According to the Yunnan Environmental Functional zoning, the surface water quality in the construction sites should be up to grade IV.

C. The monitoring results showed 1)During the 3rd quarter 2016, water quality at the two sites was both beyond the Grade IV level in terms of the concentration of TN and fecal coliforms which are bold in the table 6.13; 2)During the 4th quarter 2016, water quality at 12 sites was all beyond the Grade IV level, in which the concentration of TN and fecal coliforms at the upper-stream and down-stream of bridges (No.1, No.2, No.3 and No.4 medium bridge) was beyond the standards, and the concentration of TN, NH_3-N and fecal coliforms at the upper-stream and down-stream of 2 bridges (No.5 medium bridge and Caiyuanhe bridge) was beyond the standards.

D. Comparison analysis

- The average concentration of TN over three days at the 12 sites during the reporting period and pre-construction phase was illustrated in Figure 6.9. And the average concentration of NH_3-N over three days at the upper-stream and down-stream of 2

bridges (No.5 medium bridge and Caiyuanhe bridge) during the reporting period and pre-construction phase was illustrated in Figure 6.10. The concentration of fecal coliforms was not taken into consideration because all monitoring value was marked with ⩾24000 mg/l.

- The Figure 6.9 indicated 1) the concentration of TN at 12 sites was all beyond the standards during the three phases; 2) During the pre-construction phase, the concentration of TN at the down-stream sites was greater than the value at the corresponding upper-stream sites by between 3.9% (Caiyuan River medium bridge) and 35.4% (No.4 medium bridge). 3) During the 3rd quarter 2016, the average concentration of TN at No. 22 site was greater than the value at the No.21 by 12.2%. 4) During the 4th quarter 2016, the average concentration of TN at the down-stream sites was greater than the value at the corresponding upper-stream sites by between 6.2% (Caiyuan River medium bridge) and 33.3% (No.2 medium bridge).
- The change range of the average concentration of TN between the upper-stream and downstream in the three phases (pre-construction, the 3rd quarter, and the 4th quarter 2016) indicated the average concentration of TN in the Wulong River and Caiyuan River was mainly influenced by surrounding agricultural land, less affected by the road construction.
- The Figure 6.10 indicated 1) the concentration of NH_3-N over three days at the upper-stream and down-stream of No.5 medium bridge was beyond the Grade IV standard both in the pre-construction and in the 4th quarter 2016. The average value at the upper-stream in the 4th quarter is less than the value in the pre-construction by 10%; and the average value at the down-stream in the 4th quarter was greater than the value in the pre-construction by 22.9%. 2) In terms of Caiyuan River medium bridge, only the concentration of NH_3-N at the upper-stream site on the second day was beyond the standard in the pre-construction by 9.3%; however, the value at the upper-stream and down-stream over three days was all beyond the standard in the 4th quarter, by 25.3%-36.0%.
- The change range of the average concentration of NH_3-N at the two bridges indicated the concentration of NH_3-N in the Wulong River (No.5 medium bridge) was maybe influenced by Binghe Road construction, and the concentration of NH_3-N in the Caiyuan River (Caiyuanhe medium bridge) was maybe influenced by Mudan Road construction.

E. Summary

- The monitoring results revealed the water quality in the Wulong River (No.5 medium bridge) and the Caiyuan River (Caiyuanhe medium bridge) was possible influenced by Binghe Road and Mudan Road construction (CWD4-2).
- Measures need to be strengthened: waste water produced from construction site need to be treated before discharge to the River. Soil and water conservation measures need to be place in the construction site.

Table 6.10 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at No.1 medium bridge(1 号中桥) （Pre-construction phase and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
pH		6~9	7.98-8.02	7.98-8.08	8.0-8.12	7.33-8.06
anionic surfactants	mg/l	≤0.3	0.05L	0.09-0.1	0.05L	0.09-0.1
oil	mg/l	≤0.5	0.013-0.039	0.01L	0.027-0.044	0.01L
SS	mg/l	-	6--9	12--13	6--9	11--14
COD_{Mn}	mg/l	≤10	1.2-1.4	1.1-1.2	1.0-1.4	1.1-1.2
TN	mg/l	≤1.5	1.44-1.49	**2.27-2.43**	1.49-**1.72**	**2.63-2.83**
NH_3-N	mg/l	≤1.5	0.21-0.28	0.53-0.772	0.23-0.36	0.607-0.857
TP	mg/l	≤0.3	0.03-0.08	0.10-0.11	0.05-0.11	0.10-0.11
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	7.8-8.2	7.8-8.5	8.0-8.12	7.7-8.4
BOD_5	mg/l	≤6	2L-3.3	1.7-2.1	2L-2.7	2.2-2.4
COD_{cr}	mg/l	≤30	7.0-10.0	10L	5.0-7.0	10L

Table 6.11 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at No.2 medium bridge(2 号中桥) （Pre-construction phase and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
pH		6~9	8.03-8.06	8.01-8.04	8.02-8.05	7.98-8.08
anionic surfactants	mg/l	≤0.3	0.05L	0.05L	0.05L-0.07	0.08-0.09
oil	mg/l	≤0.5	0.011-0.020	0.01L	0.018-0.024	0.01L
SS	mg/l	-	7--10	9--14	8--11	11--18
COD_{Mn}	mg/l	≤10	1.2-1.4	1.0-1.1	1.6-1.8	1.1-1.2
TN	mg/l	≤1.5	**1.81-1.93**	**2.0-2.08**	**2.04-2.25**	**2.69-2.72**
NH_3-N	mg/l	≤1.5	0.230-0.280	0.257-0.280	0.580-0.980	0.636-0.728
TP	mg/l	≤0.3	0.05-0.08	0.06	0.09-0.12	0.11-0.12
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	7.8-8.2	8.0-8.8	7.7-8.0	7.8-8.6
BOD_5	mg/l	≤6	2L	1.1-1.2	2.6-3.0	2.0-2.4
COD_{cr}	mg/l	≤30	4.0-7.0	10L	9.0-10.0	10L

Table 6.12 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at No.3 medium bridge(3 号中桥) （Pre-construction phase and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
pH		6~9	8.04-8.06	7.98-8.08	8.03-8.09	7.33-8.06

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
anionic surfactants	mg/l	≤0.3	0.05L-0.07	0.09-0.1	0.05L-0.10	0.09-0.1
oil	mg/l	≤0.5	0.020-0.029	0.01L	0.019-0.025	0.01L
SS	mg/l	-	5--8	12--13	4--6	11--14
COD_{Mn}	mg/l	≤10	1.4-1.9	1.1-1.2	1.4-1.7	1.1-1.2
TN	mg/l	≤1.5	**1.87-2.36**	**2.27-2.43**	**2.31-2.47**	**2.63-2.83**
NH_3-N	mg/l	≤1.5	0.60-0.70	0.53-0.772	0.62-0.64	0.607-0.857
TP	mg/l	≤0.3	0.07-0.14	0.10-0.11	0.06-0.12	0.10-0.11
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	7.8-8.0	7.8-8.5	7.7-8.0	7.7-8.4
BOD_5	mg/l	≤6	2L-3.4	1.7-2.1	2.3-2.6	2.2-2.4
COD_{cr}	mg/l	≤30	11.0-14.0	10L	8.0-11.0	10L

Table 6.13 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at No.4 medium bridge(4 号中桥) （Pre-construction phase , the 3rd quarter, and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream			100m down-stream		
		Grade IV	Pre-Construction	The 3rd quarter	The 4th quarter	Pre-Construction	The 3rd quarter	The 4th quarter
pH		6~9	8.0-8.06	7.92-7.94	7.85-8.08	8.01-8.06	7.89-7.95	7.97-8.08
anionic surfactants	mg/l	≤0.3	0.05L-0.06	0.05L	0.08-0.09	0.05L-0.07	0.05-0.06	0.13-0.14
oil	mg/l	≤0.5	0.014-0.026	0.03	0.01L	0.024-0.042	0.03-0.04	0.01L
SS	mg/l	-	7--9	100-104	12--14	5--6	93-105	11--16
COD_{Mn}	mg/l	≤10	1.3-1.6	1.3-1.4	1.2	1.4-1.5	1.4	1.3
TN	mg/l	≤1.5	**1.53-2.14**	**2.87-3.33**	**2.64-2.82**	**2.23-2.55**	**3.40-3.69**	**3.24-3.43**
NH_3-N	mg/l	≤1.5	0.67-0.77	0.548-0.966	0.625-0.754	0.74-0.87	0.782-1.38	0.911-1.28
TP	mg/l	≤0.3	0.08-0.12	0-0.08	0.10-0.11	0.07-0.09	0.09-0.11	0.13-0.14
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	7.5-7.9	7.8-7.9	7.8-8.7	7.4-7.7	7.8	7.6-8.5
BOD_5	mg/l	≤6	2L-2.0	1.5-1.6	3.1-3.9	2L-2.2	1.5-1.9	4.2-4.5
COD_{cr}	mg/l	≤30	4.0-9.0	10L	10L	9.0-12.0	10L	10.6-11.2

Table 6.14 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at No.5 medium bridge(5 号中桥) （Pre-construction phase and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
pH		6~9	8.02-8.08	8.0-8.03	7.98-8.01	7.88-7.97
anionic surfactants	mg/l	≤0.3	0.13-0.25	0.14	0.04-0.044	0.12-0.13
oil	mg/l	≤0.5	0.026-0.031	0.01L	-	0.01L

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
SS	mg/l	-	6--8	13--16	10--14	11--28
COD_{Mn}	mg/l	≤10	2.0-2.7	1.2-1.4	1.8-2.0	2.0-2.2
TN	mg/l	≤1.5	**2.72-3.38**	**3.57-3.72**	**3.66-3.91**	**4.12-4.18**
NH_3-N	mg/l	≤1.5	**1.28-2.11**	**1.28-1.51**	**1.27-1.83**	**1.85-2.08**
TP	mg/l	≤0.3	0.07-0.14	0.15-0.17	0.15-0.35	0.14-0.18
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	7.4-7.9	7.4-8.4	6.9-7.0	6.0-7.2
BOD_5	mg/l	≤6	2.0-2.1	4.4-4.5	3.4-3.8	4.8-4.9
COD_{cr}	mg/l	≤30	5.0-7.0	10.2-10.5	8.0-13.0	12.9-13.2

Table 6.15 - Comparison of daily concentration of 12 parameters with standard values of Grade IV at Caiyuanhe medium bridge(菜园河中桥)（Pre-construction phase and the 4th quarter）

Parameters	Unit	Standard	50m upper-stream		100m down-stream	
		Grade IV	Pre-construction	The 4th quarter	Pre-construction	The 4th quarter
pH		6~9	7.95-7.99	7.89-7.93	7.94-7.95	7.88-7.91
anionic surfactants	mg/l	≤0.3	0.13-0.17	0.10-0.12	0.10-0.12	0.10-0.12
oil	mg/l	≤0.5	0.029-0.044	0.01L	0.031-0.041	0.01L
SS	mg/l	-	5--7	13--27	4--6	10--33
COD_{Mn}	mg/l	≤10	1.9-2.3	1.9-2.1	1.9-2.1	1.9-2.0
TN	mg/l	≤1.5	**3.40-4.00**	**3.51-3.64**	**3.27-4.45**	**3.74-3.87**
NH_3-N	mg/l	≤1.5	1.28-**1.64**	**1.88-2.04**	1.24-1.40	**1.89-1.98**
TP	mg/l	≤0.3	0.12-0.22	0.14	0.11-0.18	0.14
fecal coliforms	mg/l	≤20000	**≥24000**	**≥24000**	**≥24000**	**≥24000**
DO	mg/l	≥3	6.6-6.9	6.8-7.4	6.6-7.0	6.8-7.3
BOD_5	mg/l	≤6	3.0-3.4	3.0-3.3	2.6	4.0-4.4
COD_{cr}	mg/l	≤30	9.0-13.0	11.1-11.9	9.0-10.0	10.7-11.2

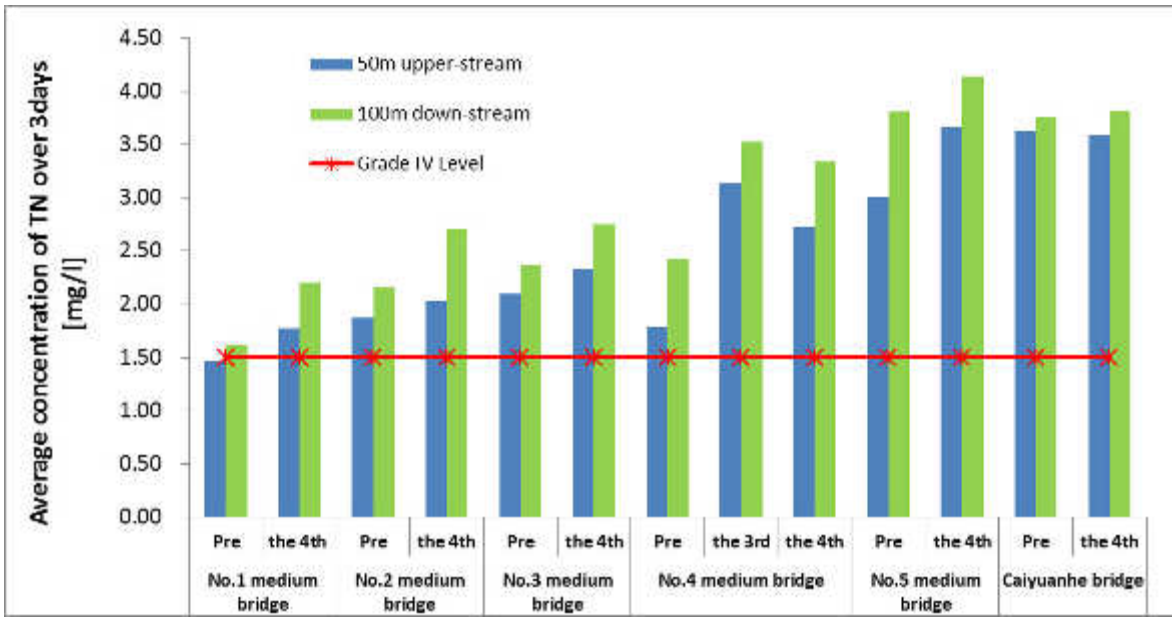


Figure 6.9 the average concentration of TN over three days at the upper-stream and down-stream of 6 bridges (pre-construction phase, the 3rd quarter and the 4th quarter 2016)

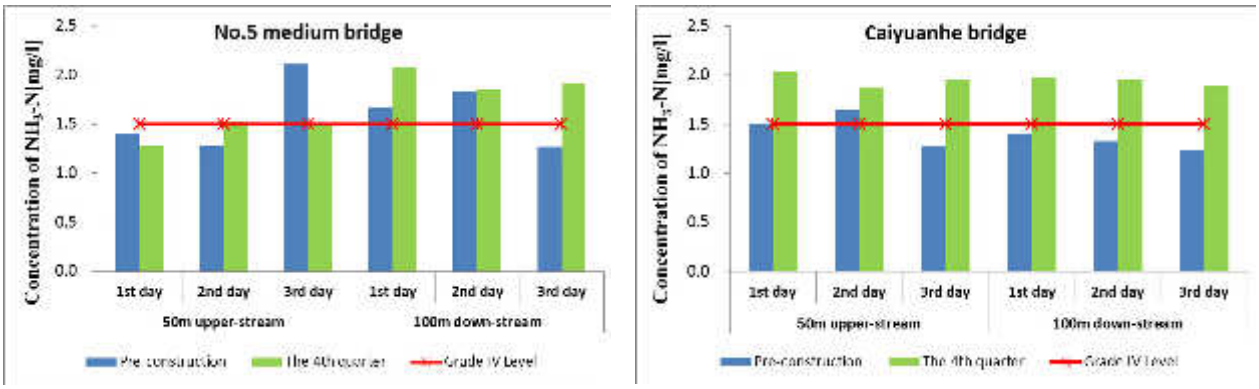


Figure 6.10 the concentration of NH_3-N at the upper-stream and down-stream of 2 bridges (pre-construction phase, the 3rd quarter and the 4th quarter 2016)

7.0 PUBLIC CONSULTATION AND GRIEVANCE REDRESS STATUS

7.1 Public Consultation Activities

46. The EMP proposed a plan for public consultation and participation. Specific details of the plan are summarized in the following table 7.1.

Table 7.1 – Public Consultation and Participation Plan

Organizer	Approach	Times/Frequency	Subjects	Participants
Project preparation				
EIA preparation authors (Institutes)	Questionnaires and interviews	During field work for EIA	Project priority, effects, attitudes to the Project/ components, and suggestions	Residents within subproject areas and construction area
TA Consultants, ADB	Site visits, and public consultations	Two rounds of formal consultation in each city, 5 review missions	Comments and recommendations of affected people and stakeholders	Representatives of affected people and stakeholder agencies
TA Consultants, and LPMOs	Establish Grievance Redress Mechanism arrangements in each county/city	Ongoing	Pathway for complaints from and resolution of environmental problems in construction and operation	Affected persons, AP representatives and other stakeholders
Construction				
PIUs, LPMOs, LIEC	Public consultation through questionnaire survey, site visits	At least once a year	Adjusting mitigation measures if necessary, construction impacts, comments and suggestions	Work staff within construction area; Residents within construction area
	Expert workshops	As needed, based on public consultation	Comments and suggestions on mitigation measures, public opinions; adjusting mitigation measures accordingly	Experts from various sectors
	Public workshops	At least once prior to mid-term review mission	EMP implementation progress, adjusting	Representatives of residents and social sectors

Organizer	Approach	Times/Frequency	Subjects	Participants
			mitigation measures if necessary, construction impacts, comments and suggestions	
Test Operation				
LPMOs, PIUs, Operators	Site visits	Multiple, depending on results of Project completion environmental audit	Comments and suggestions on operational impacts, public suggestions on corrective actions	Local residents and social sectors, EPBs
Operation				
LPMOs, PIUs, Operators	Public satisfaction survey	At least once after one year of operation	Comments and suggestions	Project beneficiaries

47. Public Consultation:

A. According to Public Consultation and Participation Plan, public consultation should be held by PIU, LPMO and LIEC at least once a year during the construction phase through questionnaire survey, site visits. Public consultation has been held in Wuding County during this reporting period. PIUs & LPMOs in Chuxiong City and Lufeng County plan to conduct public consultation in 2017.

B. Four times public consultations have been conducted by PIU&LPMO in Wuding County on 16th August, 20th September, 11th October, and 28th December 2016. The participants included Shishan Town People's government and representatives of the Xihe Village Committee. The PIU & LPMO consulted in the stakeholders' suggestions and recommendations on the compensation for farmland requisition through field survey and group meeting (Figure 7.1). The public consultation has promoted the project progress. The PIU & LPMO also consulted in the stakeholders' comments and suggestions on mitigation measures undertaken in the construction site in order to get the understanding and support from the residents within the construction area(Figure 7.1).

Figure 7.1 Public consultations conducted by PIU&LPMO in Wuding County

48. Interviews:

A. During reporting period, five contracts were in construction at the same time especially in the 4th quarter 2016 in Wuding County. The construction contractors in Wuding County conducted monthly interviews with residents living adjacent to construction sites according to requirement of EMP.

B. The contractors of CWD1, CWD2, CWD3, and CWD4-2 visited the villages or community adjacent to construction sites to investigate the potential impact of road construction, interviewed with the residents to consult in the comments on construction noise and dust caused by road construction (Figure 7.2).

Figure 7.2 Interview conducted by the construction contractors in Wuding County

7.2 Grievance Redress Mechanism and Implementation

49. As part of the capacity development, the LIEC assisted the CPPMO and LPMO in developing a Grievance Redress Mechanism. The GRM provided specific guidance and procedure in handling complaints from individuals living nearby the construction sites, groups or institutes influenced by the construction activities. The GRM was fully delineated in the EMP training workshop in May, 2015.

50. Three Project Public Complaint Units (PPCUs) has been established in the each LPMO in Chuxiong city, Wuding County and Lufeng County.

A. PPCU has been set up in LPMO in Chuxiong City and GRM was developed to handle complaints from individuals, groups or institutes influenced by the construction activities on 24th March 2016. Chenglei (陈磊) was nominated as the team leader in PPCU, and two members, Wu Yongxiang (吴永祥) and Li Guangli (李光丽), were nominated. The information of PPCU and the contact information including phone number, fax, address, and email, were published to the public through Chuxiong Prefecture Environmental Bureau's website (http://www.cxs.gov.cn/file_read.aspx?id=112029) (Figure 7.3) and information boards at CCX4 construction site (Figure 7.4). Although CCX1 contract mobilized in December 2016, the PPCU information board has not been built at the construction site yet.

Figure 7.3 GRM website announcement in Chuxiong City

Figure 7.4 PPCU information board at CCX4 construction site

B. PPCU has been set up in LPMO in Wuding County and GRM was developed to handle complaints from individuals, groups or institutes influenced by the construction activities on 20th April 2016. Tuo Guangyan (妥光彦) was nominated as the team leader in PPCU, and three members, Zhang Lei (张磊), Cao Dengyu (曹登宇) and Zhao ChunLin(赵春林), were nominated. The information of PPCU and the contact information including phone number, fax, address, and email, were published to the public through Wuding County Environmental Protection Bureau's website (http://xxgk.yn.gov.cn/Z_M_004/Info_Detail.aspx?DocumentKeyID=2232F6E3C16441B89CC5FA94270FA25E) (Figure 7.5). And five information boards were set up at construction sites in which two has been set at CWD1 and CWD4-1 sites in April, two set at CWD2 and CWD3 sites in October, and one set at CWD4-2 in November, 2016 (Figure 7.6).

Figure 7.5 GRM website announcements in Wuding County

A) GRM announcement at CWD1 site

B) GRM announcement at CWD4-1 site

C) GRM announcement at CWD2 site

D) GRM announcement at CWD3 site

E) GRM announcement at CWD4-2 site

Figure 7.5 GRM announcement board at construction sites in Wuding County

C. PPCU has been set up in LPMO in Lufeng County and GRM was developed to handle complaints from individuals, groups or institutes influenced by the construction activities on 3rd November 2016. Liao Yuhong (廖钰虹) was nominated as the team leader in PPCU, and three members, Yin Ziqing (尹自清), Chen Zhijuan (陈志娟) and Chen Junyu(陈俊雨), were nominated. The information of PPCU and the contact information including phone number, fax, address, and email, were published to the public through Lufeng County e-government website (http://www.ynlf.gov.cn/ContentView.aspx?id=25823&tag=44) (Figure 7.7) and information boards at CLFR1 construction site (Figure 7.8).

Figure 7.7 GRM website announcements in Lufeng County

Figure 7.8 GRM announcement boards at CLFR1 site in Lufeng County

51. There is no any complaint received by the PPCUs in Chuxiong City, Wuding County and Lufeng County since GRM established in the city and county.

8.0 INSTITUTIONAL STRENGTHENING AND TRAINING

52. The first EMP training workshop was held in Chuxiong city, on May 27th, 2015. The international and national environmental experts from the LIEC gave five lectures covering ADB Loan Project Environmental Management Manual, Safeguarding Policy, Environmental Impact Assessment, Environmental Management Plan (EMP), and Environmental Policy and law in China. Around 30 attendees participated in the training workshop, covering staff from CPPMO, LPMOs, PIUs, Water & Soil Conservation Bureaus, local EMS and one Wuding's CSC. Throughout one day's workshop, the participants got some ideas about the safeguard concepts, EIA, EMP, ADB Safeguard Policy 2009, and regulatory requirements for Environmental Management.

53. The second EMP in-depth 2-day training workshop was proposed by the international and national environmental experts when the first training workshop ended because the participants have not read the EMP document before they came to the training workshop, and no one had previous experiences in relating to environmental management. The 2-day in-depth training workshop was held on June, 15th -16th, 2015, after sites inspection and discussion with nominated environmental staffs from CPPMO, LPMOs, and PIUs. The training topics included specific procedures in carrying out prescribed EMP activities and tasks, report preparation and reporting procedures. The responsibility of contractor, CSCs and EMS in EMP was emphasized and explained step by step. Workshop also focused on sampling and laboratory analytical procedures, national standards, identified specific sampling locations for air, water and noise, as well as ensuring requirements for both EMP and EIA implementation are carried out concurrently. Throughout the in-depth training shop, EMP reports prepared for other similar ADB financed projects in China were used as samples to demonstrate the scope and structure of EMR reports. The workshop enhanced the capacity of EMP implementation at the different levels.

54. The 3rd EMP training workshop was held in Wuding County on November 11th, 2015, and in Chuxiong city on November 13th, 2015, corresponding to three construction activities commenced (CCX4 in Chuxiong city, CWD1&CWD4-1 in Wuding County). The aim of the site environmental management workshop is to give specific guidance on procedure in carrying out the EMP at the three construction sites. Staffs form LPMO, PIU, Two contractors and one CSC took part in the workshop in Wuding County, and staffs from LPMO, PIU, and one contractor and one CSC attended the workshop in Chuxiong city. Key points on environmental management requirement in EIA and PA was highlighted and explained to all participants. The potential environmental impacts of the road construction and mitigated measures needed to implement was clearly clarified. Three responsibilities for road Contractors (Establish site environmental management plan, Implement mitigated measures, and summarize the progress of project monthly, and submit monthly progress report to PIU and LPMO.) were summarized and template of monthly progress report was prepared and handed over. Two responsibilities for CSCs (implement internal monitoring to supervise the mitigation measures undertaken by the contractors, and summarized and wrote monthly supervise report.) were outlined and template of monthly supervise report was prepared and handed over. The 3rd EMP training workshop with detailed materials has strengthened the environmental management capacity for the contractors, CSCs, and EMUs in CPPMO, LPMOs, and PIUs.

55. The 4th EMP training workshop was held in CPPMO on 19th May, 2016. The main objective of the workshop was to enhance the capacity of the contractors, CSCs, and PIUs & LPMO on report preparation and report procedures. The staffs from CPPMO and LPMO in Chuxiong city, Wuding County and Lufeng County, 3 contractors of CCX4, CWD1 and CWD4-1, CSCs and EEMs attended the training workshop. The existing problems from the monthly progress reports prepared by the contractors and CSCs, from the quarterly progress reports prepared by PIUs and LPMOs were highlighted and discussed in-detail. The guidance to implement EMP was re-interpreted by LIEC technically. The reports submitting schedules in 2016 was clearly required by LIEC also.

56. The 5th EMP training workshop was held LPMOs in Wuding County, Lufeng County and Chuxiong City on 25th – 28th October, 2016, respectively.

A. On 25th October, the national environmental expert and the environmental coordinator at CPPMO inspected the construction sites in Wuding County. And the EMP training workshop was held in Wuding LPMO meeting room on 26th October. The participants including the staff from PIU and LPMO, 3 contractors (1 retained to implement CWD1&CWD2, 1 retained to implement CWD3, and 1 retained to implement CWD4-1&CWD4-2), and 1 CSC attended the training workshop. Most of the participants had attended the 2nd, 3rd, 4th EMP training workshop before. Two participants were laymen in terms of EMP; one is the new nominated the EMU leader at LPMO in Wuding County (Yang Youqing), another is the contractor of CWD3 (Beijing Xinchang Road & Bridge Co.Ltd) who was a new admission in Wuding County project. So the first agenda was to briefly introduce the framework of EMP, the requirement of EMP, the responsibility of contractor and the EMU, and the report submitting system. The second agenda was to concern over the issues arising during the road construction and report preparation. The requirement of site environment management was outlined and a temple of monthly progress report was prepared and handed over to the contractor of CWD3.

B. On 27th October, the national environmental expert and the environmental coordinator at CPPMO inspected the construction site in Lufeng County where no roads and river was in construction yet. And the EMP training workshop was held in Lufeng LPMO meeting room in the afternoon. The participants included the staff from PIU and LPMO, one contractor of CLFR1 (Guangdong Dayu Water Resource Construction Co.Ltd) and one CSC of CLFR1 (Yunnan Urban Construction Consulting & Supervising Co. Ltd) attended the training workshop. The CLFR1 was the first contract to commence in Lufeng County and planned to mobilize in November. It was first time for the contractor and CSC of CLFR1 to attend the EMP training workshop. So in-depth introduction of EMP framework, EMP requirement, responsibility of contractor and CSC was addressed by the national environmental expert. Then using the monthly report prepared by the contractor of CWD1 in Wuding County as a case study, to emphases the responsibility of contractor (Establish site environmental management plan, Implement mitigated measures, and summarize the progress of project monthly, and submit monthly progress report to PIU and LPMO). Similarly, the responsibility of CSC (implement internal monitoring to supervise the mitigation measures undertaken by the contractors, and summarized and wrote monthly supervise report) was illustrated by the case study report in Wuding County. The responsibility of PIU & LPMO was highlighted and the quarterly report requirement was explained by analyzing the quarterly report prepared by

PIU & LPMO in Wuding County. Finally, the temple of monthly progress report and supervise report, and quarterly progress report were prepared and handed over to the contractor, CSC and LPMO in Lufeng County.

C. On 28th October 2016, the EMP training workshop was held in Chuxiong City LPMO meeting room. The staffs from PIU & LPMO in Chuxiong City, the contractor of CCX4, and two CSCs (Kunming Construction Consulting & Supervising Co. Ltd for road construction; and Yunnan Rundian Project Technology Consulting Co. Ltd for river enhancement) attended the workshop. The major topic of the training workshop was to analyze and discuss the issues met and arose in the implementation of EMP. Advise on improve the report quality prepared by contractor, CSC and LPMO was addressed by the national environmental expert. At the same time, the brief introduction of EMP framework, EMP requirement, and responsibility of CSC was outlined to the CSC of Longchuan River enhancement. The template of the report has not been handed over to CSC for the River enhancement was not to commence in recent phase.

D. The 5th EMP training workshop enhanced the capacity of the contractors, the CSCs, and the LPMO to implement EMP during construction phase. A notification was issued by CPPMO after the 5th EMP training workshop. The notification re-clarified the responsibility of LIEC, EMP coordinator in CPPMO, environmental leader and coordinator in EMU; and performed the duties to the people; unified the audit procedure and submission schedule for environmental report; unified the relevant matters of environmental monitoring during the construction phase and stressed the need to pay attention to the important matters in EMP.

9.0 CONCLUSIONS

9.1 Progress of EMP Implementation

57. Environmental management system has been established for the project of 3115-PRC. The CPPMO also retained CUCD as the LIEC (Loan Implementation Environmental Consultant with international and national environmental experts). An EMP Coordinator (Environmental Specialist) was nominated at the CPPMO level, and EMUs (Environmental Management Unit) were established at the LPMO level. Three CSCs have been retained by PIUs in Chuxiong city, Wuding County and Lufeng County, and one environmental engineer was appointed at the eight construction sites by CSCs. GRM was introduced to CPPMO, LPMO and PIUs by LIEC, and GRM has been established in Chuxiong City, Wuding County and Lufeng County sites in 2016 respectively.

58. The LIEC updated the EMP and Monitoring programs of the project after site inspection and discussion with staffs from CPPMO, LPMOs, PIUs, and EMS. Five EMP training workshops were presented by LIEC which guided the environmental staffs from CPPMO, LPMO, PIUs, Contractors, CSCs, and EMS to implement EMP prior to construction and throughout construction. LIEC gave advice on the bid documents (eight contractors and three CSCs) to make sure the EMP requirements were included.

59. During the report period, seven contractors of CCX1, CWD1, CWD2, CWD3, CWD4-1, CWD4-2 and CLFR1 have carried out the mitigation measures as specified in the contract agreement (CCX4 was in shutdown condition); and the contractors submitted the monthly progress reports to PIUs. The environmental engineer from CSCs did visual inspection on surface water, air, noise, solid waste, soil erosion, occupational health and safety weekly and monthly to evaluate the environmental management performance of the contractors. The performance monitoring reports were prepared and submitted to PIUs and LPMOs. The Yunnan Fangyuan Technical Co. Ltd was retained by contractor of CLFR1 to do internal water quality monitoring in December, 2016; the monitoring results was analyzed in the monthly progress report in December. CPEMS conducted the environmental monitoring for existing conditions (pre-construction phase) in Lufeng County site, the 3rd quarter impact monitoring and the 4th quarter impact monitoring in Wuding County site. And the monitoring reports were submitted to PIUs & LPMOs in Wuding County and Lufeng County. The quarterly reports were prepared by the PIUs & LPMOs in Chuxionag City, Wuding County and Lufeng County and submitted to CPPMO.

60. Monitoring results during the reporting period:

A. The internal monitoring implemented by CSCs showed the most contractors have taken proper mitigation measures to alleviate the potential impacts of construction activities on air, noise, solid waste, soil erosion, and surface water.

B. The existing condition monitoring results indicated the water quality at the 8 sites of East-west River enhancement project in Lufeng County was beyond the Grade IV level (GB3838-2002) in terms of the concentration of TN and fecal coliforms; ambient air quality at the four construction sites meet the Grade II standard (GB3095-2012); the

noise environmental quality at the 13 sensitive receivers around the construction site meet the standard of class II environmental function zone (GB3096-2008).

C. The 3rd impact monitoring results of Wuding Urban Infrastructure Components in Wuding County showed the emission of air pollutants at the four boundary sites was accordance with the standard maximum emission values(GB16297-1996); the ambient air quality at 8 sensitive receivers was accordance with the Grade II level(GB3095-2012); the noise environmental quality at the two boundary sites (No.1 and No.4) was beyond the *Construction Site Noise Emission Standards*(GB12523-2011); the noise environmental quality at two sensitive receivers (No.10 and No.12) was beyond the standards(GB3096-2008); the water quality at the two sites in Wulong River was beyond the Grade IV level (GB3838-2002) in terms of the concentration of TN and fecal coliforms.

D. The 4th impact monitoring results of Wuding Urban Infrastructure Components in Wuding County site showed the emission of air pollutants at the four boundary sites was accordance with the standard maximum emission values(GB16297-1996); the ambient air quality at 2 sensitive receivers was beyond the Grade II level(GB3095-2012) in terms of the concentration of PM_{10}; the noise environmental quality at the four boundary sites was beyond the *Construction Site Noise Emission Standards*(GB12523-2011); the noise environmental quality at three sensitive receivers (No.5, No.6 and No.8) was beyond the Grade II standards(GB3096-2008); the water quality at the 12 sites in Wulong River and Caiyuan River was beyond the Grade IV level (GB3838-2002) in terms of the concentration of TN, NH_3-N and fecal coliforms.

E. The 3rd impact monitoring results indicated that the impact of road construction on air, noise and water quality was insignificant during the 3rd quarter in Wuding County.

F. The 4th impact monitoring results indicated the concentration of PM_{10} at the two sensitive receivers in November was influenced by the construction dust; the noise at the boundary sites and the sensitive receivers was possible influenced by the road construction; the water quality in the Wulong River (No.5 medium bridge) and the Caiyuan River (Caiyuanhe medium bridge) was possible influenced by Binghe Road and Mudan Road construction (CWD4-2).

9.2 Issues and Corrective Actions

61. According to the monthly progress reports prepared by CSC in Chuxiong City, the mitigation measures on solid waste, community health and safety, and occupational health and safety have not been in place in CCX1 construction site during the reporting period. Corrective actions need to take in 2017 including 1) Provide appropriate waste collection and storage containers at the construction site, and properly remove and dispose of any significant residual materials and waste; 2) Appropriate fencing, security warning signs and GRM information board set up, and posters need to be displayed prominently in relevant areas of the site; 3) Provide personal protection equipment, such as helmets and gloves; 4) Establish the records management system; 5) Train all construction workers in basic sanitation, general health and safety matters; 6) Conduct monthly interview with the residents living adjacent to construction sites.

62. According to the monthly progress reports prepared by CSC in Wuding County, the mitigation measure on solid waste at the CWD3 and CWD4-2 sites has not been in right place in

October and November. Corrective actions have been implemented by the two contractors at the two sites in December, 2016.

63. The impact monitoring results illustrated mitigation measures on dust generated by construction activities were not in place at the CWD1 site in October and November in Wuding County. The mitigation measures should be strengthened during construction period especially in dry season, including 1) increasing the frequency of water spraying when fugitive dust is being generated; 2) strengthening the vehicles maintain; 3) covering all materials during truck transportation.

64. The impact monitoring results indicated mitigation measures on noise generated by construction activities need to be strengthen in Wuding County site. The operation of machinery and movement of heavy vehicles along urban and village roads between 22:00 and 06:00 the next day should be strictly prohibited. If the operation of machinery has to be done at night, the residents living adjacent to construction site should be informed, and only with the consent of the inhabitant, the operation can be done at night.

65. The impact monitoring results illustrated mitigation measures on surface water waste water and soil erosion were not in place in 4th quarter 2016 in Wuding County site. Waste water produced from construction site (CWD4-2) need to be treated before discharge to the River. And soil and water conservation measures need to be strengthened in the construction site.

10.0 APPENDICES

10.1 APPENDIX I –Existing Monitoring Results of Lufeng Urban Infrastructure Components in Lufeng County

10.2 APPENDIX II – The 1st Internal Monitoring Results of East-West River Enhancement in Lufeng County

10.3 APPENDIX III – The 3rd Quarterly Monitoring Results of Wuding Urban Infrastructure Components in Wuding County, 2016

10.4 APPENDIX IV –The 4th Quarterly Monitoring Results of Wuding Urban Infrastructure Components in Wuding County, 2016

APPENDIX I –Existing Monitoring Results of Lufeng Urban Infrastructure Components in Lufeng County

CMA
162512050198

副本

监 测 报 告

楚环监字[2016]第 113 号

项目名称：亚洲开发银行贷款楚雄州城市基础设施建设项目——禄丰县城市道路与河道综合治理工程环境管理计划施工前现状监测

委托单位：禄丰县城市建设开发投资有限公司

监测类别：委托性监测

编制日期：2016 年 8 月 16 日

楚雄彝族自治州环境监测站

1、样品情况

表1 样品情况

委托（或受检）单位	禄丰县城市建设开发投资有限公司	采样地点	详见监测结果一览表
样品类型	地表水、环境空气	采样方式	监测方现场取样
样品数量	环境空气：二氧化硫日均浓度样品12个，二氧化氮日均浓度样品12个，TSP日均浓度样品12个，PM_{10}日均浓度样品12个 地表水环境：24个	保存方式	常温保存
采样时间	2016年7月19-21日	采样人	环境空气：刘云伟、施国飞、蔡永刚、李天波、罗仕团 地表水：杨梅、杨晓龙、蔡永刚、李慧红、罗映菊、何开伟
送样时间	环境空气：2016年7月19-21日 地表水：2016年7月19-21日	送样人	环境空气：刘云伟、施国飞、李天波、何开伟、李怡青 地表水：蔡永刚、李慧红、罗映菊、丁一
接样时间	环境空气：2016年7月19-21日 地表水：2016年7月19-21日	接样人	郭文俊、杨梅
分析时间	2016年7月19-26日	分析人员	环境空气：杨晓龙、杨梅 地表水：周宇晖、甘晓、段如晓、罗琼芬、张彪、杨梅、洪一丹
样品状态描述	样品状态符合监测规范、标签完整		

2、 监测项目、方法、设备

表2　监测分析方法及主要仪器一览表

监测项目	监测方法	监测和分析设备	仪器编号	方法检出限
pH	便携式pH计法《水和废水监测分析方法》（第四版增补版）国家环境保护总局（2002年）	Multi3420便携式多参数测定仪	JL-28	——
溶解氧	水质　溶解氧的测定 电化学探头法 HJ506－2009	Multi3420便携式多参数测定仪	JL-28	——
高锰酸盐指数	水质　高锰酸盐指数的测定 GB11892－89	酸式滴定管	——	0.5（mg/L）
五日生化需氧量	水质　五日生化需氧量(BOD_5)的测定　稀释与接种法 HJ505-2009	LRH-250A生化培养箱 Multi3420便携式多参数测定仪 酸式滴定管	FZ-05 JL-143	0.5（mg/L）
氨氮	水质　氨氮的测定 纳氏试剂分光光度法 HJ535－2009	UV－1750紫外可见分光光度计	JL-12	0.025（mg/L）
石油类	水质 石油类和动植物油类的测定 红外分光光度法 HJ637-2012	OiL460型红外分光测油仪	JL-125	0.01（mg/L）
阴离子表面活性剂	水质 阴离子表面活性剂的测定 亚甲蓝分光光度法 GB7494-87	T6紫外可见分光光度计	JL-25	0.05（mg/L）
粪大肠菌群	水质　粪大肠菌群的测定 多管发酵法和滤膜法 HJ/T347-2007	SW-CT-2FD洁净工作台 LRH-150B生化培养箱 DHP-360电热恒温培养箱	FZ-35 FZ-29 FZ-36	2（MPN/L）
化学需氧量	水质　化学需氧量的测定 重铬酸盐法 GB11914-89	HCA-101 COD消解器 酸式滴定管	FZ-87-89	10（mg/L）

总氮	水质 总氮的测定 碱性过硫酸钾消解 紫外分光光度法 HJ636—2012	UV—1750 紫外可见分光光度计	JL-12	0.05（mg/L）
总磷	水质 总磷的测定 钼酸铵分光光度法 GB11893-89	T6 紫外可见分光光度计	JL-25	0.01（mg/L）
悬浮物	水质 悬浮物的测定 重量法 GB11901-89	CPA 225D 电子天平	JL-01	取样量500ml： 0.8（mg/L） 取样量100ml： 4（mg/L） 取样量200ml： 2（mg/L）
砷	水质 汞、砷、硒、铋和锑的测定 原子荧光法 HJ694-2014	AFS-230E 原子荧光光度计 可调式电热板	JL-14 FZ-98	0.0003（mg/L）
镉	石墨炉原子吸收法测定镉、铜和铅《水和废水监测分析方法》(第四版增补版)国家环境保护总局（2002年）	ICE3400 石墨炉	JL-05A	0.0001（mg/L）
二氧化硫（SO_2）	环境空气 二氧化硫的测定 甲醛吸收-副玫瑰苯胺分光光度法 HJ 482-2009	便携式恒温采样器 TH-3000BIV、722s 分光光度计	JL-95 JL-96	0.007（mg/m³）
二氧化氮（NO_2）	环境空气 氮氧化物（一氧化氮和二氧化氮）的测定 盐酸萘乙二胺分光光度法（HJ479-2009）		JL-97 JL-100 JL-102	0.015（mg/m³）
总悬浮颗粒物（TSP）	环境空气 总悬浮颗粒物的测定 重量法 GBT15432-1995	大流量空气采样器 TH-1000C 型、MS204S 电子环保天平	JL-92 JL-93 JL-94	0.001（mg/m³）
可吸入颗粒物（PM_{10}）	环境空气中 PM_{10} 和 $PM_{2.5}$ 的测定 重量法 HJ618-2011		JL-98 JL-127 JL-128 JL-129 JL-130	0.001（mg/m³）
环境噪声	《声环境质量标准》 GB3096-2008	AWA6228 多功能声级计 AWA6221A 声校准器	JL-106 JL-134 JL-135	30dB（A）

3、 监测结果

表3　地表水监测结果一览表

监测日期	监测点位	监测项目（含单位）及结果													
		pH（无量纲）	悬浮物（mg/L）	高锰酸盐指数（mg/L）	镉（mg/L）	砷（mg/L）	总磷（mg/L）	石油类（mg/L）	阴离子表面活性剂（mg/L）	粪大肠菌群（个/L）	溶解氧（mg/L）	五日生化需氧量（mg/L）	化学需氧量（mg/L）	总氮（mg/L）	氨氮（mg/L）
2016年7月19日	东河河道治理起始端上游50米	8.28	14	3.50	0.0001L	0.0014	0.087	0.01	0.07	≥24000	6.5	0.8	10.8	1.46	0.277
	东河汇入西河交叉口西河上游50米	7.68	9	3.41	0.0001L	0.0010	0.114	0.01	0.07	≥24000	5.1	1.3	12.5	1.90	0.378
	西河河道治理起始端上游50米	7.63	14	3.11	0.0001L	0.0012	0.104	0.02	0.05L	≥24000	5.9	1.0	15.0	1.97	0.257
	西河河道治理末端下游100米	7.99	15	3.73	0.0001L	0.0010	0.124	0.01	0.06	≥24000	5.9	1.2	13.2	1.57	0.355
	1号路与西河交叉处上游50米	7.63	14	3.11	——	——	0.104	0.02	0.05L	≥24000	5.9	1.0	15.0	1.97	0.257
	1号路与西河交叉处下游100米	7.65	16	3.75	——	——	0.124	0.02	0.05L	≥24000	5.7	1.0	12.4	2.07	0.411
	2号路与西河交叉处上游50米	7.62	15	3.33	——	——	0.110	0.01	0.05L	16000	5.6	1.1	14.9	1.79	0.347
	2号路与西河交叉处下游100米	7.69	20	3.45	——	——	0.141	0.02	0.10	≥24000	5.1	1.4	11.0	2.19	0.486
2016年7月20日	东河河道治理起始端上游50米	8.25	57	3.49	0.0001L	0.0015	0.114	0.01L	0.08	≥24000	6.9	1.0	11.2	1.67	0.386
	东河汇入西河交叉口西河上游50米	7.73	59	3.74	0.0001L	0.0014	0.158	0.01L	0.08	≥24000	5.2	1.2	16.6	1.98	0.409
	西河河道治理起始端上游50米	7.76	56	3.83	0.0001L	0.0019	0.144	0.01	0.08	≥24000	6.0	1.3	15.8	2.04	0.277

	西河河道治理末端下游100米	7.91	50	3.85	0.0001L	0.0015	0.138	0.01	0.06	≥24000	5.7	1.3	15.4	2.18	0.422
	1号路与西河交叉处上游50米	7.76	56	3.83	——	——	0.144	0.01	0.08	≥24000	6.0	1.3	15.8	2.04	0.277
	1号路与西河交叉处下游100米	7.79	83	3.76	——	——	0.165	0.01L	0.08	≥24000	6.2	1.2	16.2	2.26	0.468
	2号路与西河交叉处上游50米	7.74	56	3.53	——	——	0.148	0.01L	0.08	≥24000	5.8	1.3	17.9	1.62	0.398
	2号路与西河交叉处下游100米	7.74	70	3.69	——	——	0.144	0.01	0.07	≥24000	5.8	1.6	15.8	2.10	0.445
2016年7月21日	东河河道治理起始端上游50米	8.28	30	3.18	0.0001L	0.0011	0.059	0.01	0.09	≥24000	6.7	0.9	11.2	1.37	0.264
	东河汇入西河交叉口西河上游50米	7.74	25	3.38	0.0001L	0.0011	0.107	0.01	0.05	≥24000	5.1	1.1	12.3	1.80	0.362
	西河河道治理起始端上游50米	7.70	28	3.36	0.0001L	0.0010	0.100	0.01	0.06	≥24000	6.2	1.3	14.8	1.89	0.293
	西河河道治理末端下游100米	7.94	27	3.53	0.0001L	0.0011	0.107	0.01L	0.05L	≥24000	6.0	1.0	13.3	2.02	0.380
	1号路与西河交叉处上游50米	7.70	28	3.36	——	——	0.100	0.01	0.06	≥24000	6.2	1.3	14.8	1.89	0.293
	1号路与西河交叉处下游100米	7.72	32	4.29	——	——	0.141	0.02	0.05	≥24000	5.7	1.3	12.7	2.00	0.435
	2号路与西河交叉处上游50米	7.70	30	2.74	——	——	0.110	0.01L	0.06	≥24000	5.6	1.2	14.7	1.40	0.386
	2号路与西河交叉处下游100米	7.71	33	3.62	——	——	0.144	0.01	0.05L	16000	5.5	1.3	11.4	1.86	0.476

备注：低于项目方法检出限的结果，结果上报方式为“检出限L”。

表4　环境空气监测结果一览表　单位：ug/m³(标)

样品类别	监测日期	采样地点（项目区周界外）	SO_2	NO_2	PM_{10}	TSP
环境空气	2016年7月19日	禄丰职中	5	13	23	37
		官连社区	6	13	19	25
		上营三组	6	11	20	23
		禄丰一中	6	12	28	46
	2016年7月20日	禄丰职中	9	11	29	42
		官连社区	8	10	10	23
		上营三组	9	8	18	24
		禄丰一中	8	9	22	29
	2016年7月21日	禄丰职中	6	11	43	66
		官连社区	6	10	21	33
		上营三组	8	9	22	29
		禄丰一中	7	12	29	43

表5　声环境监测结果一览表

监测点位	监测结果　单位：dB（A）			
	2016年7月19日		2016年7月20日	
	昼间	夜间	昼间	夜间
官连小区	45	48	47	40
禄丰职中	48	44	47	45
厂房村	46	41	44	43
庄科村	43	42	51	44
旧学村	42	48	50	49
西山村	48	45	48	46
金澜半岛	50	44	57	45
上营	55	46	53	47
大北厂	51	44	50	50
小北厂	46	48	50	47
禄丰一中	48	47	54	49
松园中学	55	43	59	44
秦家营	47	45	45	40

4 、监测结果评价

1）地表水：本次所监测的8个断面（1号路与西河交叉处上游50米、东河汇入西河交叉口西河上游50米、西河河道治理起始端上游50米、西河河道治理末端下游100米、1号路与西河交叉处上游50米、1号路与西河交叉处下游100米、2号路与西河交叉处上游50米以及2号路与西河交叉处下游100米）水环境执行《地表水环境质量标准》（GB3838-2002）IV类标准，参照该标准进行评价， 8个断面水质均劣于IV类标准，超标因子为总氮和粪大肠菌群。

2）环境空气：本次所监测区域环境空气执行《环境空气质量标准》（GB3095-2012）二级标准，参照该标准进行评价，所监测四个监测点位的 SO_2、NO_2、TSP及 PM_{10} 的24小时均值符合二级标准。

3）声环境：本次所监测区域声环境执行《声环境质量标准》（GB3096-2008）2类标准，参照该标准进行评价，所监测的13个点位均符合2类标准。

5、 附件：监测委托单

编制：施国飞 日期：2016 年 8 月 16 日

校核：高雁舞. 施敏 日期：2016 年 8 月 17 日

审核：刘永伟 日期：2016 年 8 月 18 日

批准：周宇晖 日期：2016 年 8 月 25 日

标识：CXEMSCWD4.5.14-01

监 测 委 托 单

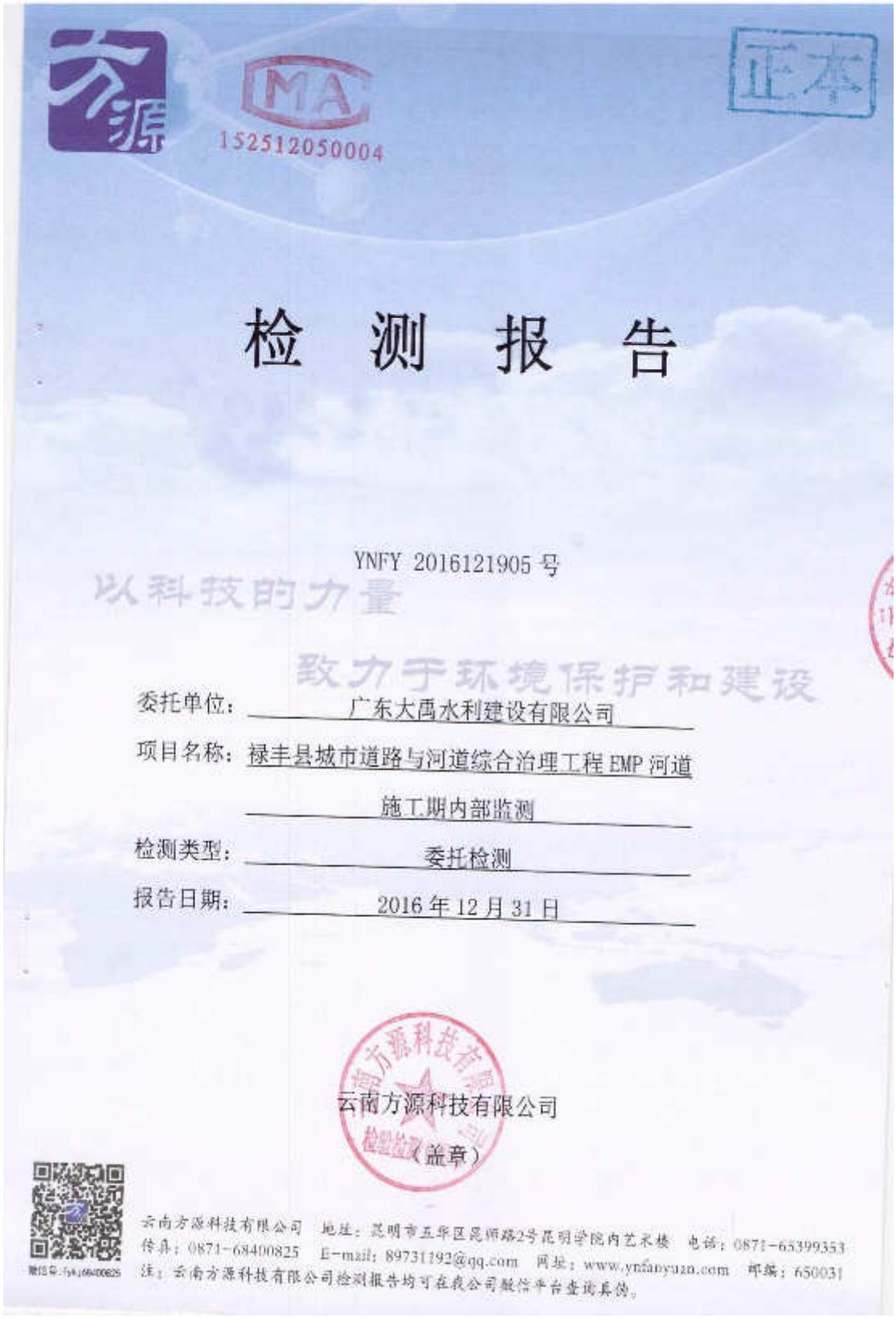
任务编号：

委托单位名称	禄丰县城市建设开发投资有限公司		
地　　址	禄丰县秦安路老国税局		
邮政编码		联系人	陈俊雨
联系电话	18008785393	传　真	
采　样□	采样人：监测方	采样日期	2016.07.19 ~2016.07.21
送　检□	送检人：监测方	送检日期	2016.07.19 ~2016.07.21
项目名称	亚洲开发银行贷款楚雄州城市基础设施建设项目--禄丰县城市道路与河道综合治理工程环境管理计划施工前现状监测		
监测要求	1、声环境：13个声环境敏感点：官洼小区、上营、大北厂、小北厂、禄丰一中、庄科村、西山村、金澜半岛、松园中学、禄丰职中、厂房村、旧学村、秦家营）的LAeq，昼夜各一次；2、水环境：河道治理区及市政设施建设区周边8个断面的pH, DO,SS,CODcr,石油类, 阴离子表面活性剂, NH_3N,CODmn,BOD_5,TN,TP,粪大肠菌群, 砷和镉；3、环境空气：项目施工场界外4个大气浓度监控点的TSP, SO_2, NO_2,PM_{10}连续24小时采样，取日均值。		
样品类别	水☑；气☑；固体□；噪声□；其它□		
样品保存方式（对送样而言）	常温☑；低温□；添加固定剂种类□；		
样品数量	环境空气：192个样品；地表水：144个样品。		
样品编号			
非标方法对方确认	签名：		
未认证项目对方确认	签名：		
分包对方确认	签名：		
备　　注			

委托单位负责人：　　被委托单位负责人：

日　　期：2016.06.27　　日　　期：2016.06.07

APPENDIX II – The 1st Internal Monitoring Results of East-West River Enhancement in Lufeng County



方源

CMA 152512050004

正本

检 测 报 告

YNFY 2016121905 号

以科技的力量

致力于环境保护和建设

委托单位：广东大禹水利建设有限公司

项目名称：禄丰县城市道路与河道综合治理工程 EMP 河道施工期内部监测

检测类型：委托检测

报告日期：2016 年 12 月 31 日

云南方源科技有限公司

（盖章）

云南方源科技有限公司 地址：昆明市五华区昆师路2号昆明学院内艺术楼 电话：0871-65399353
传真：0871-68400825 E-mail：89731192@qq.com 网址：www.ynfangyuan.com 邮编：650031

注：云南方源科技有限公司检测报告均可在我公司微信平台查询真伪。

检测报告说明及声明

一、报告无"云南方源科技有限公司检验检测专用章"、"CMA"章和"正本"章无效。

二、报告内容涂改无效；无编制、校核、审核和批准（授权签字人）签字无效。

三、委托单位对本检测报告如有异议，请于收到报告之日起十五日内向本公司提出或申请复验，逾期不申请的，视为认可本检测报告。

四、由委托单位自行采集的样品，测试条件和工况变化大的样品、无法保存和复现的样品，其检验检测数据、结果仅证明样品所检验检测项目的符合性情况。

五、未经本公司书面批准，不得复制报告（全文复制除外），复制报告未加盖"云南方源科技有限公司检验检测专用章"无效。

六、未经本公司书面批准，本报告及数据不得用于商业宣传及其它非研究类用途，违者必究。

七、本报告正本二份，副本一份。

云南方源科技有限公司通讯资料

检测业务联系电话：0871-65399353

检测报告的意见和解释联系电话：0871-68400825

传　真：0871-65399353

E-mail：1101412981@qq.com

质量投诉电话及传真：0871-65399353

邮政编码：650031

地　址：云南省昆明经开区经开路 3 号科技创新园 2A8-23 室

检测地址：云南省昆明市五华区昆师路 2 号

一、样品概况

表 1-1 样品概况表

委托单位	广东大禹水利建设有限公司				
项目名称	禄丰县城市道路与河道综合治理工程 EMP 河道施工期内部监测				
检测项目点位及频次	水质： 监测点位：CLFR1 施工区域东河河道治理起点上游 50 米、CLFR1 施工区域西河河道治理起点上游 50 米、CLFR1 施工区域东河汇入西河交叉口西河上游 50 米、CLFR1 施工区域东河汇入西河交叉口东河上游 50、CLFR1 施工区域东河汇入西河交叉口下游 100 米、CLFR1 施工区域工程终点下游 100 米，共 6 个监测点； 监测因子：pH、溶解氧、悬浮物、化学需氧量、石油类、阴离子表面活性剂、氨氮、高锰酸盐指数、五日生化需氧量、总氮、总磷、粪大肠菌群、砷、镉，共 14 个监测因子； 监测频次：连续监测 3 天，每天监测 1 次。				
采样方式	委托方采样（ ） 检测方采样（√）	采样人	张天宇 杜灿海 张林岗	采样时间	2016.12.24~2016.12.26
送样人：张天宇 杜灿海 张林岗		接样人：白萍珍		接样时间	2016.12.24~2016.12.26
检测时间	2016.12.24~2016.12.31				
样品状态描述：标签完整，样品采集符合采样规范。					

二、检测项目、方法、检测设备和检测人员

表 2-1 检测项目、方法、检测设备和检测人员情况表

分析项目	方法依据	分析仪器	仪器编号	检出限	分析人员
化学需氧量	水质 化学需氧量的测定 重铬酸盐法 GB 11914-89	酸式滴定管	/	10 mg/L	王琼
悬浮物	水质 悬浮物的测定 重量法 GB 11901-89	梅特勒 AL204 电子天平	YNFY-YQSB-024	4 mg/L	张艳平
氨氮	水质 氨氮的测 纳氏试剂分光光度法 HJ 535-2009	721 型 可见分光光度计	YNFY-YQSB-182	0.025 mg/L	谭希 黄槿
石油类	水质 石油类和动植物油的测定红外光度法 HJ 637-2012	OIL-460 红外测油仪	YNFY-YQSB-036	0.01 mg/L	张银图

（续）表 2-1 检测项目、方法、检测设备和检测人员情况表

分析项目	方法依据	分析仪器	仪器编号	检出限	分析人员
总磷	水质 总磷的测定 钼酸铵分光光度法 GB 11893-89	721 型 可见分光光度计	YNFY-YQSB-008	0.01 mg/L	张银丽
pH	水质 PH 的测定 玻璃电极法 GB 6920-86	PHs-3C 精密 pH 计	YNFY-YQSB-005	/	张银丽
总氮	水质 总氮的测定 碱性过硫酸钾消解紫外分光光度法 HJ636-2012	T6 新世纪 紫外可见分光光度计	YNFY-YQSB-010	0.05 mg/L	谭希 黄槿
高锰酸盐指数	高锰酸盐指数 《水和废水监测分析方法》（第四版增补版）国家环保局（2002 年）	酸式滴定管	/	0.5mg/L	谭希 黄槿
溶解氧	水质 溶解氧的测定 碘量法 GB 7489—1987	酸式滴定管	/	0.2mg/L	王琼
五日生化需氧量	水质 五日生化需氧量(BOD_5)的测定稀释与接种法 HJ 505-2009	SPX-250B-Z 型 生化培养箱 酸式滴定管	YNFY-YQSB-017	0.5 mg/L	王琼
粪大肠菌群	水质 粪大肠菌群的测定 多管发酵法和滤膜法（HJ/T 347-2007）	HPX-9082MBE 数显电热培养箱	YNFY-YQSB-047	/	张艳平
阴离子表面活性剂	水质 阴离子表面活性剂的测定 亚甲蓝分光光度法 GB/T 7494-87	721 型 可见分光光度计	YNFY-YQSB-008	0.05 mg/L	张银丽
铜	水质 32 种元素的测定 电感耦合等离子体发射光谱法 HJ 776-2015	PE2100 型 电感耦合等离子体发射光谱仪	YNFY-YQSB-132	0.05 mg/L	徐燕波
砷	水质 汞、砷、硒、铋和锑的测定原子荧光法 HJ 694-2014	AFS-230E 型 原子荧光光度计	YNFY-YQSB-110	0.3 μg/L	谭希

三、检测结果

表 3-1 水质检测结果表

检测项目 \ 点位/时间/编号	CLFR1 施工区域东河河道治理起点上游 50 米（1#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-01	20161219051-07	20161219051-13
pH（无量纲）	7.86	7.82	7.92
石油类（mg/L）	0.02	0.02	0.02
总磷（mg/L）	0.05	0.05	0.06
阴离子表面活性剂（mg/L）	0.288	0.272	0.259
氨氮（mg/L）	0.257	0.238	0.256
总氮（mg/L）	0.958	1.04	1.02
高锰酸盐指数（mg/L）	2.3	2.3	1.8
化学需氧量（mg/L）	<10	<10	<10
五日生化需氧量（mg/L）	1.1	1.7	0.8
溶解氧（mg/L）	8.8	8.7	8.8
悬浮物（mg/L）	9	10	8
粪大肠菌群（MPN/L）	940	790	700
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3
检测项目 \ 点位/时间/编号	CLFR1 施工区域西河河道治理起点上游 50 米（2#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-02	20161219051-08	20161219051-14
pH（无量纲）	7.98	8.02	8.04
石油类（mg/L）	0.02	0.02	0.03
总磷（mg/L）	0.06	0.06	0.07
阴离子表面活性剂（mg/L）	0.263	0.247	0.220
氨氮（mg/L）	0.189	0.197	0.194
总氮（mg/L）	0.652	0.681	0.690
高锰酸盐指数（mg/L）	1.9	2.0	1.9
化学需氧量（mg/L）	<10	<10	<10
五日生化需氧量（mg/L）	1.3	1.4	1.0
溶解氧（mg/L）	8.7	8.8	8.7
悬浮物（mg/L）	24	19	21
粪大肠菌群（MPN/L）	340	430	490
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3

（续）表 3-1 水质检测结果表

检测项目 \ 点位/时间/编号	CLFR1 施工区域东河汇入西河交叉口西河上游 50 米（3#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-03	20161219051-09	20161219051-15
pH（无量纲）	8.36	8.42	8.46
石油类（mg/L）	0.01	0.01	0.02
总磷（mg/L）	0.05	0.05	0.06
阴离子表面活性剂（mg/L）	0.202	0.190	0.172
氨氮（mg/L）	0.540	0.524	0.534
总氮（mg/L）	1.40	1.42	1.39
高锰酸盐指数（mg/L）	2.4	2.3	2.1
化学需氧量（mg/L）	10	13	13
五日生化需氧量（mg/L）	2.2	3.0	2.7
溶解氧（mg/L）	8.5	8.3	8.4
悬浮物（mg/L）	6	9	7
粪大肠菌群（MPN/L）	3.3×10^3	2.7×10^3	2.6×10^3
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3
检测项目 \ 点位/时间/编号	CLFR1 施工区域东河汇入西河交叉口东河上游 50 米（4#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-04	20161219051-10	20161219051-16
pH（无量纲）	7.94	7.98	7.99
石油类（mg/L）	0.02	0.01	0.02
总磷（mg/L）	0.04	0.03	0.04
阴离子表面活性剂（mg/L）	0.268	0.240	0.222
氨氮（mg/L）	0.374	0.360	0.382
总氮（mg/L）	1.25	1.22	1.28
高锰酸盐指数（mg/L）	2.3	2.4	2.3
化学需氧量（mg/L）	<10	10	10
五日生化需氧量（mg/L）	2.1	2.5	2.5
溶解氧（mg/L）	8.7	8.5	8.5
悬浮物（mg/L）	8	6	5
粪大肠菌群（MPN/L）	460	630	490
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3

（续）表 3-1 水质检测结果表

检测项目 \ 点位/时间/编号	CLFR1 施工区域东河汇入西河交叉口下游 100 米（5#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-05	20161219051-11	20161219051-17
pH（无量纲）	8.36	8.44	8.44
石油类（mg/L）	0.02	0.02	0.02
总磷（mg/L）	0.08	0.07	0.09
阴离子表面活性剂（mg/L）	0.293	0.266	0.270
氨氮（mg/L）	0.706	0.692	0.698
总氮（mg/L）	1.59	1.60	1.60
高锰酸盐指数（mg/L）	2.1	2.6	2.8
化学需氧量（mg/L）	23	27	28
五日生化需氧量（mg/L）	5.1	5.8	5.9
溶解氧（mg/L）	7.7	7.6	7.6
悬浮物（mg/L）	26	21	24
粪大肠菌群（MPN/L）	3.5×10^3	3.5×10^3	2.8×10^3
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3
检测项目 \ 点位/时间/编号	CLFR1 施工区域工程终点下游 100 米（6#）		
	2016.12.24	2016.12.25	2016.12.26
	20161219051-06	20161219051-12	20161219051-18
pH（无量纲）	8.45	8.50	8.58
石油类（mg/L）	0.04	0.05	0.04
总磷（mg/L）	0.08	0.09	0.10
阴离子表面活性剂（mg/L）	0.281	0.297	0.278
氨氮（mg/L）	0.730	0.724	0.742
总氮（mg/L）	1.75	1.80	1.83
高锰酸盐指数（mg/L）	2.6	2.9	3.0
化学需氧量（mg/L）	17	24	26
五日生化需氧量（mg/L）	3.4	5.1	5.6
溶解氧（mg/L）	7.9	7.8	7.9
悬浮物（mg/L）	11	13	10
粪大肠菌群（MPN/L）	4.3×10^3	4.6×10^3	4.3×10^3
镉（mg/L）	<0.05	<0.05	<0.05
砷（μg/L）	<0.3	<0.3	<0.3

附表 1：

点位	执行标准	是否达到标准	超标指标
CLFR1 施工区域东河河道治理起点上游 50 米（1#）	地表水环境质量标准Ⅳ类	是	无
CLFR1 施工区域西河河道治理起点上游 50 米（2#）	地表水环境质量标准Ⅳ类	是	无
CLFR1 施工区域东河汇入西河交叉口西河上游 50 米（3#）	地表水环境质量标准Ⅳ类	是	无
CLFR1 施工区域东河汇入西河交叉口东河上游 50 米（4#）	地表水环境质量标准Ⅳ类	是	无
CLFR1 施工区域东河汇入西河交叉口下游 100 米（5#）	地表水环境质量标准Ⅳ类	否	总氮
CLFR1 施工区域工程终点下游 100 米（6#）	地表水环境质量标准Ⅳ类	否	总氮
评价：通过现场反馈及数据梳理得出其超标主要由周边农田灌溉污染导致。			

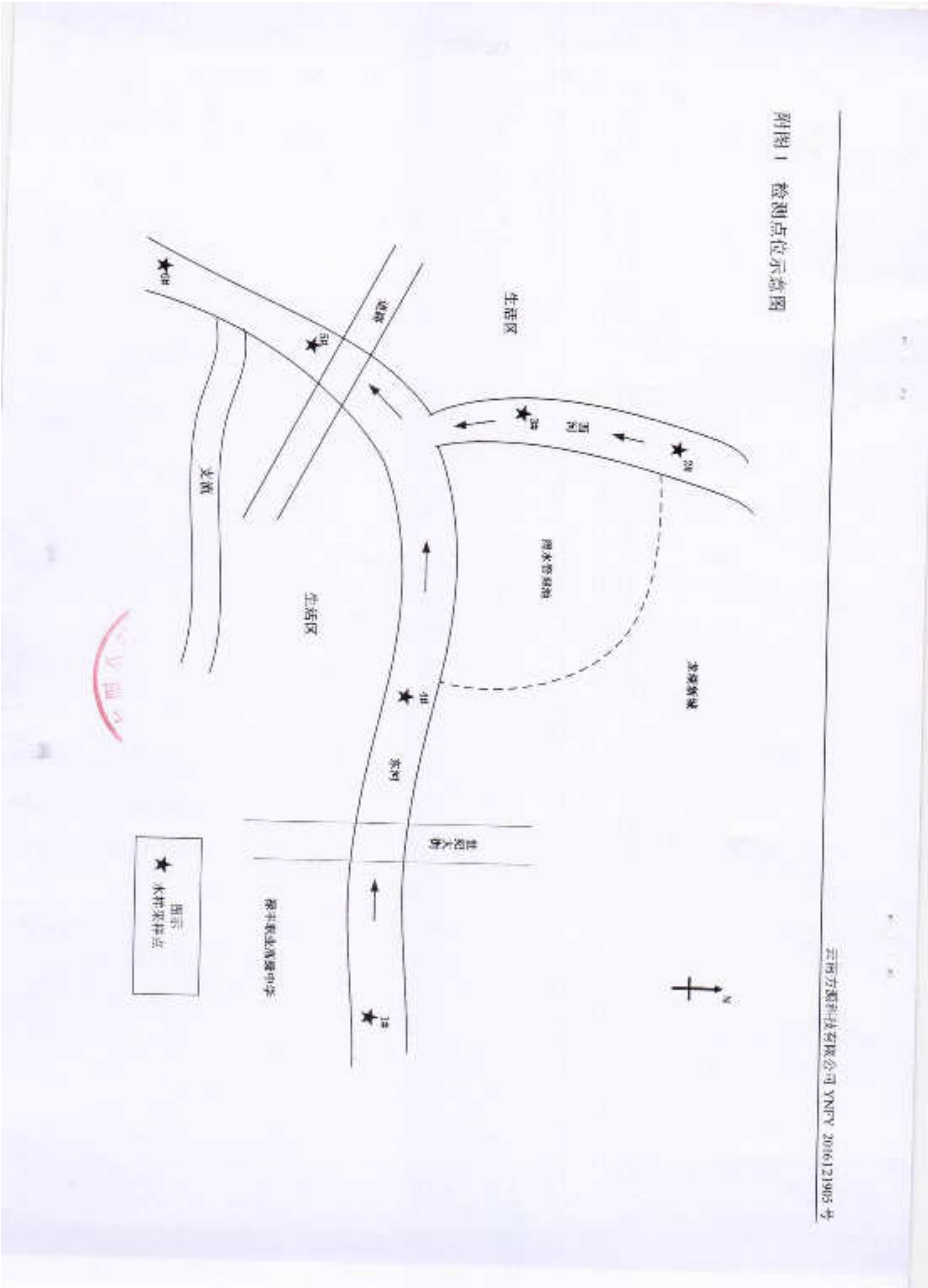
以下无数据

编制：杨淑艳 职位：报告编制员 杨淑艳 日期：2016.12.31

校核：余秋宏 职位：质量负责人助理 余秋宏 日期：2016.12.31

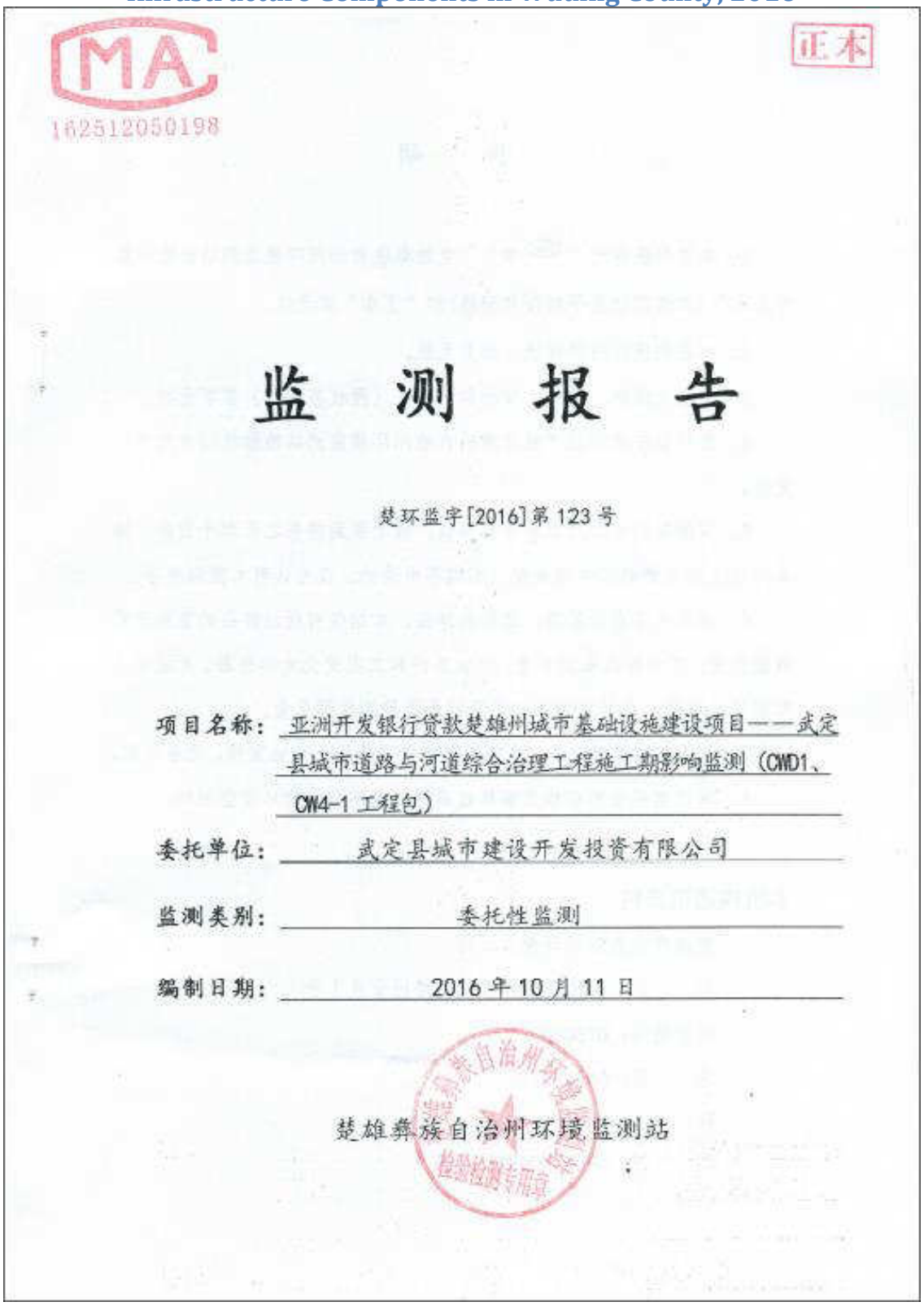
审核：段玲玲 职位：质量负责人助理 段玲玲 日期：2016.1231

批准：何燕 职位：质量负责人 何燕 日期：2016.12.31


附图1 检测点位示意图
生活区
生活区
支流
东河
西河
图示
水样采样点
云南方源科技有限公司 YNFY 2016121905 号


以科技的力量
致力于环境保护和建设
云南方源科技有限公司 地址：昆明市五华区昆师路2号昆明学院内艺术楼 电话：0871-65399353
传真：0871-68400825 E-mail：89731192@qq.com 网址：www.yufanyuan.com 邮编：650031
注：云南方源科技有限公司检测报告均可在我公司微信平台查询真伪

APPENDIX III – The 3rd Quarterly Monitoring Results of Wuding Urban Infrastructure Components in Wuding County, 2016



CMA
162512050198

正本

监 测 报 告

楚环监字[2016]第 123 号

项目名称：亚洲开发银行贷款楚雄州城市基础设施建设项目——武定县城市道路与河道综合治理工程施工期影响监测（CWD1、CW4-1 工程包）

委托单位：武定县城市建设开发投资有限公司

监测类别：委托性监测

编制日期：2016 年 10 月 11 日

楚雄彝族自治州环境监测站

声　　明

1、本监测报告无“CMA章”、“楚雄彝族自治州环境监测站检验检测专用章”(本章须加盖于封面和骑缝)和“正本”章无效。

2、本监测报告内容涂改、撕页无效。

3、报告无编制、校核、审核和批准人（授权签字人）签字无效。

4、复制报告未加盖“楚雄彝族自治州环境监测站检验检测专用章”无效。

5、监测委托方如对本报告有异议，请于收到报告之日起十日内，向本站或上级主管部门申请复测，逾期不申请的，视为认可本监测报告。

6、由委托方自行采集、送检的样品，本站仅对所送样品的监测分析数据负责，不对样品来源负责；测试条件和工况变化大的样品、无法保存和复现的样品，本站仅对本次所采样品的监测数据负责。

7、未经本站书面批准，本报告及数据不得用于商业宣传，违者必究。

8、本监测报告所有权及解释权属楚雄彝族自治州环境监测站。

本机构通讯资料

楚雄彝族自治州环境监测站

地　　址：云南省楚雄市双建路经贸巷 1 号

邮政编码：675000

电　　话：0878-3122253

传　　真：0878-3122253

邮　　箱：cxhk_000@163.com

1、样品情况

表 1 样品情况

委托（或受检）单位	武定县城市建设开发投资有限公司	采样地点	详见监测结果表
样品类型	地表水、环境空气	采样方式	监测方现场取样
样品数量	环境空气：二氧化硫、二氧化氮、颗粒物小时浓度样品各 48 个；二氧化硫、二氧化氮、PM_{10}、TSP 24 小时平均浓度样品各 24 个； 地表水：6 个。	保存方式	常温保存
采样时间	2016 年 9 月 20 日—23 日	采样人	施国飞、罗兆丹、杨家麒、何汝军、甘晓、姚宗明、张文荣、李晓尘、李韬、张彪、叶宇航、蔡永刚、李慧红、华剑宏、郭文俊
送样时间	环境空气：2016 年 9 月 20 日-22 日 地表水：2016 年 9 月 21 日-23 日	送样人	地表水：张彪 环境空气：何汝军、施国飞、甘晓、郭文俊
接样时间	环境空气：2016 年 9 月 20 日-22 日 地表水：2016 年 9 月 23 日	接样人	杨梅、何汝军
分析时间	2016 年 9 月 20 日-9 月 27 日	分析人员	周宇晖、王敏、高雁海、罗兆丹、何汝军、段如晓、甘晓、罗琼芬、杨梅、张彪、丁一、蔡永刚、华剑宏、李慧红、罗映菊、郭文俊
样品状态描述	样品状态符合监测规范、标签完整。		

2、 监测项目、方法、设备

表 2 监测分析方法及主要仪器一览表

监测项目	监测方法	监测和分析设备	仪器编号	方法检出限
pH	便携式 pH 计法《水和废水监测分析方法》（第四版）国家环境保护总局（2002 年）	便携式多参数测定仪 Multi3420	JL-28	——
溶解氧	水质 溶解氧的测定 电化学探头法（HJ506-2009）	便携式多参数测定仪 Multi3420	JL-28	0.1（mg/L）
悬浮物	水质 悬浮物的测定 重量法（GB11901-89）	CPA 225D 电子天平	JL-01	100ml 4mg/l 1000ml. 0.4mg/L
高锰酸盐指数	水质 高锰酸盐指数的测定（GB11892-89）	酸式滴定管	——	0.5（mg/L）
五日生化需氧量（BOD_5）	水质 五日生化需氧量（BOD_5）的测定 稀释与接种法（HJ505-2009）	LRH-250A 生化培养箱 便携式多参数测定仪 Multi3430	FZ-05 JL-143	0.5（mg/L）
氨氮	水质 氨氮的测定 纳氏试剂分光光度法（HJ535-2009）	UV-1750 紫外可见分光光度计	JL-12	0.025（mg/L）
石油类	水质 石油类和动植物油类的测定 红外光度法（HJ637-2012）	OIL460 型红外分光测油仪	JL-125	0.01（mg/L）
化学需氧量	水质 化学需氧量（COD）的测定 重铬酸盐法（GB11914-89）	HCA-101 COD 消解器 酸式滴定管	FZ-87-89	10（mg/L）

总氮	水质 总氮的测定 碱性过硫酸钾消解紫外分光光度法（HJ636-2012）	UV-1750 紫外可见分光光度计	JL-12	0.05（mg/L）
总磷	水质 总磷的测定 钼酸铵分光光度法（GB11893-89）	T6 紫外可见分光光度计	JL-23	0.01（mg/L）
阴离子表面活性剂	水质 阴离子表面活性剂的测定 亚甲蓝分光光度法（GB7494—87）	T6 紫外可见分光光度计	JL-23	0.05（mg/L）
粪大肠菌群	水质 粪大肠菌群的测定 多管发酵法和滤膜法（HJ/T 347-2007）（试行）多管发酵法	SW-CT-2FD 洁净工作台 LRH-150B 生化培养箱 DHP-360 型电热恒温培养箱	FZ-35 FZ-29 FZ-36	2（MPN/L）
二氧化硫（SO_2）小时浓度	环境空气 二氧化硫的测定 甲醛吸收-副玫瑰苯胺分光光度法（HJ 482-2009）	中流量空气颗粒物采样器 TH-1500CIII 恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C 722s 分光光度计 大气采样器 ZR-3500	JL-112 JL-116 JL-119 JL-120	0.007（mg/m^3）
二氧化氮（NO_2）小时浓度	环境空气 氮氧化物（一氧化氮和二氧化氮）的测定 盐酸萘乙二胺分光光度法（HJ479-2009）			0.005（mg/m^3）
氮氧化物（NO_x）小时浓度				
二氧化硫（SO_2）日均浓度	环境空气 二氧化硫的测定 甲醛吸收-副玫瑰苯胺分光光度法（HJ 482-2009）	恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C	JL-92 JL-93 JL-94 JL-95	0.028（mg/m^3）

二氧化氮（NO_2）日均浓度 氮氧化物（NO_x）日均浓度	环境空气 氮氧化物（一氧化氮和二氧化氮）的测定 盐酸萘乙二胺分光光度法（HJ479-2009）	722s 分光光度计	JL-154 JL-155 JL-156 JL-157	0.003（mg/m^3）
总悬浮颗粒物（TSP） 颗粒物	环境空气 总悬浮颗粒物的测定 重量法（GB/T15432-1995）	中流量空气颗粒物采样器 TH-1500CIII 恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C MS204S 电子天平	JL-127 JL-129 JL-131 JL-143 JL-144 JL-145 JL-146	0.001（mg/m^3）
可吸入颗粒物（PM_{10}）	环境空气中 PM_{10} 和 $PM_{2.5}$ 的测定 重量法（HJ618-2011）		JL-147 JL-148 JL-149 JL-150 JL-151 JL-152 JL-132	0.001（mg/m^3）
环境噪声	《声环境质量标准》（GB3096-2008）	AWA6228 多功能声级计 AWA6221A 声校准器	JL-134 JL-135 JL-107	——
建筑施工场界环境噪声	《建筑施工场界环境噪声排放标准》（GB12523-2011）	AWA6228 多功能声级计 AWA6221A 声校准器	JL-134 JL-135 JL-107	——

3、 监测结果

表3　地表水监测结果一览表

监测日期	监测点位	监测项目（含单位）及结果											
		pH（无量纲）	阴离子表面活性剂（mg/L）	石油类（mg/L）	悬浮物（mg/L）	高锰酸盐指数（mg/L）	总氮（mg/L）	氨氮（mg/L）	总磷（mg/L）	粪大肠菌群（个/L）	溶解氧（mg/l）	五日生化需氧量（mg/L）	化学需氧量（mg/L）
2016年9月21日	CWD1包（北城大道）跨越乌龙河4号中桥上游50米	7.94	0.05L	3.03	100	1.4	2.87	0.548	0.08	≥24000	7.8	1.6	10L
	CWD1包（北城大道）跨越乌龙河4号中桥下游100米	7.91	0.05	3.04	93	1.4	3.40	0.782	0.09	≥24000	7.8	1.9	10L
2016年9月22日	CWD1包（北城大道）跨越乌龙河4号中桥上游50米	7.93	0.05L	3.03	102	1.3	3.23	0.966	0.10	≥24000	7.9	1.6	10L
	CWD1包（北城大道）跨越乌龙河4号中桥下游100米	7.95	0.06	0.04	110	1.4	3.49	1.34	0.11	≥24000	7.8	1.5	10L
2016年9月23日	CWD1包（北城大道）跨越乌龙河4号中桥上游50米	7.92	0.05L	0.03	104	1.4	3.33	0.786	0.9	≥24000	7.9	1.5	10L
	CWD1包（北城大道）跨越乌龙河4号中桥下游100米	7.89	0.06	0.03	105	1.4	3.69	1.38	0.10	≥24000	7.8	1.5	10L

表 4 环境空气施工场地边界外无组织监测结果一览表

样品类别	采样地点	监测日期	时段	SO_2 (mg/标 m^3)	NO_x (mg/标 m^3)	颗粒物 (mg/m^3)
环境空气	整个项目区域施工现场边界外无组织排放浓度监控点北街社区	2016 年 9 月 20 日	09:00-10:00	0.009	0.027	0.091
			11:00-12:00	0.012	0.020	0.114
			14:00-15:00	0.009	0.017	0.159
			16:00-17:00	0.010	0.015	0.114
		2016 年 9 月 21 日	09:00-10:00	0.009	0.013	0.097
			11:00-12:00	0.013	0.014	0.045
			14:00-15:00	0.011	0.012	0.090
			16:00-17:00	0.011	0.010	0.116
		2016 年 9 月 22 日	09:00-10:00	0.009	0.013	0.068
			11:00-12:00	0.010	0.013	0.205
			14:00-15:00	0.008	0.024	0.114
			16:00-17:00	0.008	0.016	0.114
	整个项目区域施工现场边界外无组织排放浓度监控点旧城社区	2016 年 9 月 20 日	09:00-10:00	0.010	0.023	0.111
			11:00-12:00	0.012	0.011	0.111
			14:00-15:00	0.008	0.020	0.111
			16:00-17:00	0.009	0.009	0.133
		2016 年 9 月 21 日	09:00-10:00	0.017	0.027	0.133
			11:00-12:00	0.012	0.018	0.091
			14:00-15:00	0.011	0.011	0.067
			16:00-17:00	0.017	0.010	0.133
		2016 年 9 月 22 日	09:00-10:00	0.009	0.020	0.089
			11:00-12:00	0.011	0.030	0.178
			14:00-15:00	0.011	0.022	0.356
			16:00-17:00	0.013	0.028	0.267
	整个项目区域施工现场边界外无组织排放浓度监控点武定县政协	2016 年 9 月 20 日	09:00-10:00	0.012	0.035	0.067
			11:00-12:00	0.013	0.024	0.089
			14:00-15:00	0.012	0.031	0.068
			16:00-17:00	0.011	0.035	0.182
		2016 年 9 月 21 日	09:00-10:00	0.011	0.053	0.136
			11:00-12:00	0.014	0.046	0.133
			14:00-15:00	0.012	0.027	0.295
			16:00-17:00	0.015	0.051	0.250
		2016 年 9 月 22 日	09:00-10:00	0.011	0.075	0.182
			11:00-12:00	0.016	0.060	0.091
			14:00-15:00	0.010	0.039	0.136
			16:00-17:00	0.011	0.056	0.159
	整个项目区域施工现场边界外无组织排放浓度监控点西和村委会	2016 年 9 月 20 日	09:00-10:00	0.014	0.015	0.067
			11:00-12:00	0.011	0.013	0.067
			14:00-15:00	0.010	0.013	0.068
			16:00-17:00	0.011	0.017	0.070
		2016 年 9 月 21 日	09:00-10:00	0.010	0.019	0.140
			11:00-12:00	0.011	0.021	0.068
			14:00-15:00	0.012	0.014	0.070
			16:00-17:00	0.009	0.013	0.068
		2016 年 9 月 22 日	09:00-10:00	0.012	0.027	0.133
			11:00-12:00	0.010	0.014	0.111
			14:00-15:00	0.010	0.017	0.068
			16:00-17:00	0.008	0.017	0.182

表 5 环境空气敏感点监测结果一览表

样品类别	采样地点	检测日期	TSP (ug/m³)	PM_{10} (ug/m³)	SO_2 (ug/标 m³)	NO_2 (ug/标 m³)
环境空气	西和村	2016 年 9 月 20 日	18	10	10	10
		2016 年 9 月 21 日	29	10	12	9
		2016 年 9 月 22 日	49	19	8	12
	下旧城	2016 年 9 月 20 日	50	23	7	14
		2016 年 9 月 21 日	56	44	8	15
		2016 年 9 月 22 日	81	64	7	19
	罗婺家园大酒店	2016 年 9 月 20 日	37	29	9	23
		2016 年 9 月 21 日	115	70	8	19
		2016 年 9 月 22 日	137	91	9	19
	县中医院	2016 年 9 月 20 日	42	26	9	12
		2016 年 9 月 21 日	44	38	8	9
		2016 年 9 月 22 日	72	65	7	15
	思源实验学校	2016 年 9 月 20 日	22	15	8	7
		2016 年 9 月 21 日	36	29	12	16
		2016 年 9 月 22 日	64	53	7	15
	荣合小区	2016 年 9 月 20 日	16	12	10	14
		2016 年 9 月 21 日	41	36	11	13
		2016 年 9 月 22 日	57	48	7	14
	白邑村	2016 年 9 月 20 日	26	16	11	10
		2016 年 9 月 21 日	83	44	9	10
		2016 年 9 月 22 日	228	131	9	16
	上旧城	2016 年 9 月 20 日	37	27	11	31
		2016 年 9 月 21 日	113	72	12	24
		2016 年 9 月 22 日	119	85	9	20

6 施工场界噪声监测结果一览表

监测点位	监测结果 单位：dB（A）					
	2016 年 9 月 20 日			2016 年 9 月 21 日		
	昼间	夜间	夜间（max）	昼间	夜间	夜间（max）
旧城社区	55	48	60	50	46	62
北街社区	47	44	62	43	42	59
县政协	60	60	83	62	55	72
西和村委会	58	47	76	57	48	72

表 7 声环境敏感点噪声监测结果一览表

监测点位	监测结果 单位：dB（A）			
	2016 年 9 月 20 日		2016 年 9 月 21 日	
	昼 间	夜 间	昼 间	夜 间
西和村	54	49	56	46
白邑村	50	49	46	44
上旧城	52	43	48	43
下旧城	44	41	46	42
思源实验学校	53	46	50	48
荣合小区	62	56	61	55
县中医院	56	45	54	44
罗婺家园大酒店	57	49	56	52

4 、监测结果评价（本结果评价不属于认证范围）

（1）地表水：参照《地表水环境质量标准》（GB3838-2002）执行Ⅳ类标准进行评价，所监测的两个地表水断面中：CWD1 包（北城大道）跨越乌龙河 4 号中桥上游 50 米处和 CWD1 包（北城大道）跨越乌龙河 4 号中桥下游 100 米处劣于Ⅳ类标准，超标污染物为总氮。

（2）环境空气：施工现场边界外无组织排放浓度监测点参照《大气污染物综合排放标准》（GB16297-1996）进行评价。环境空气敏感点参照《环境空气质量标准》（GB3095-2012）进行评价，执行二类功能区标准。具体情况见下表：

表 8 施工现场边界外无组织排放浓度监测点评价结果一览表

点位 \ 评价 \ 时间	9 月 20 日	9 月 21 日	9 月 22 日
北衙社区	符合标准	符合标准	符合标准
旧城社区	符合标准	符合标准	符合标准
武定县政协	符合标准	符合标准	符合标准
西和村委会	符合标准	符合标准	符合标准

表 9 环境空气敏感点评价结果一览表

点位 \ 评价 \ 时间	9 月 20 日	9 月 21 日	9 月 22 日
西和村	符合二类	符合二类	符合二类
下旧城	符合二类	符合二类	符合二类
县中医院	符合二类	符合二类	符合二类
罗婺家园大酒店	符合二类	符合二类	符合二类
上旧城	符合二类	符合二类	符合二类
白邑村	符合二类	符合二类	符合二类
思源实验学校	符合二类	符合二类	符合二类
荣和小区	符合二类	符合二类	符合二类

（3）环境噪声：参照《建筑施工场界环境噪声排放标准》（GB12523-2011）对施工场界噪声监测点进行评价；参照《声环境质量标准》（GB3096-2008）对声环境敏感点进行评价，执行二类功能区标准。具体情况见下表：

表 10 施工场界噪声监测点评价结果一览表

点位 \ 评价 \ 时间	2016 年 9 月 20 日			2016 年 9 月 21 日		
	昼间	夜间	夜间（max）	昼间	夜间	夜间（max）
旧城社区	符合标准	符合标准	符合标准	符合标准	符合标准	符合标准
北街社区	符合标准	符合标准	符合标准	符合标准	符合标准	符合标准
县政协	符合标准	劣于标准	劣于标准	符合标准	劣于标准	劣于标准
西和村委	符合标准	符合标准	劣于标准	符合标准	符合标准	劣于标准

表 11 声环境敏感点评价结果一览表

点位 \ 评价 \ 时间	2016 年 9 月 20 日		2016 年 9 月 21 日	
	昼间	夜间	昼间	夜间
西和村	符合二类	符合二类	符合二类	符合二类
白邑村	符合二类	符合二类	符合二类	符合二类
上旧城	符合二类	符合二类	符合二类	符合二类
下旧城	符合二类	符合二类	符合二类	符合二类
思源实验学校	符合二类	符合二类	符合二类	符合二类
荣合小区	劣于二类	劣于二类	劣于二类	劣于二类
县中医院	符合二类	符合二类	符合二类	符合二类
罗婺家园大酒店	符合二类	符合二类	符合二类	劣于二类

5、 附件：监测委托单

编制：[illegible] 日期：2016 年 10 月 11 日

校核：[illegible] 日期：2016 年 10 月 11 日

审核：[illegible] 日期：2016 年 10 月 12 日

批准：[illegible] 日期：2016 年 10 月 12 日

标识：CXEMSCWD4.5.14-03

监 测 委 托 单

任务编号：2016105

客户信息	委托方：武定县城市建设开发投资有限公司	
	项目名称：[illegible]	
	通讯地址：武定县狮山镇北片区方[illegible]411号	邮政编码：651600
	联系人：陶庆友 联系电话：18987803671 传真：0878-8710869	E-mail：
	报告领取方式：□自取 □邮寄 □传真 □E-mail	预计提交报告时间： 年 月 日

监测类型	☑委托监测 □仲裁 □其他
采样方式	□客户自送 ☑监测方采样
监测方法	☑国标方法 □行标方法 □非标方法项目：无 确认签字：陶庆友 □未认证项目：无 确认签字：陶庆友 □分包项目：无 确认签字：陶庆友
样品状态	□固体 □粉末 ☑液体 ☑气体 □其他
余样处理	□客户方取回 ☑实验室自行消纳
水样保存条件	☑常温 □避光 ☑低温（ ℃） □____
样品数量	水样：[illegible]	特殊要求	
提交报告份数	一式 4 份	监测费用	125787.90 元 （大写）[illegible]
说明	1. 委托送样时间以委托或收样签字为准。 2. 委托监测样品仅对来样负责。 3. 未尽事宜双方协商解决。

序号	样品名称	监测项目
1	水样	[illegible]
2	[illegible]	二氧化硫、二氧化氮、颗粒物、PM10、TSP。
3	噪声环境监测	等效连续A声级。
备注		
委托方签字	2016年9月8日	监测方签字	2016年 月8日

地 址：楚雄市双建路延资巷1号楚雄彝族自治州环境监测站

电 话：0878-3122253 传 真：0878-3122253

APPENDIX IV –The 4th Quarterly Monitoring Results of Wuding Urban Infrastructure Components in Wuding County, 2016

CMA 162512050198

正本

监 测 报 告

楚环监字[2016]第 162 号

项目名称：亚洲开发银行贷款楚雄州城市基础设施建设项目——武定县城市道路与河道综合治理工程环境管理计划施工期环境影响监测（CWD1、CWD2、CWD3、CWD4-1、CWD4-2 工程包）

委托单位：武定县城市建设开发投资有限公司

监测类别：委托性监测

编制日期：2016 年 12 月 7 日

楚雄彝族自治州环境监测站

声　　明

1、本监测报告无“CMA章”、“楚雄彝族自治州环境监测站检验检测专用章”(本章须加盖于封面和骑缝)和“正本”章无效。

2、本监测报告内容涂改、撕页无效。

3、报告无编制、校核、审核和批准人（授权签字人）签字无效。

4、复制报告未加盖“楚雄彝族自治州环境监测站检验检测专用章”无效。

5、监测委托方如对本报告有异议，请于收到报告之日起十日内，向本站或上级主管部门申请复测，逾期不申请的，视为认可本监测报告。

6、由委托方自行采集、送检的样品，本站仅对所送样品的监测分析数据负责，不对样品来源负责；测试条件和工况变化大的样品、无法保存和复现的样品，本站仅对本次所采样品的监测数据负责。

7、未经本站书面批准，本报告及数据不得用于商业宣传，违者必究。

8、本监测报告所有权及解释权属楚雄彝族自治州环境监测站。

本机构通讯资料

楚雄彝族自治州环境监测站

地　　址：云南省楚雄市双建路经贸巷 1 号

邮政编码：675000

电　　话：0878-3122253

传　　真：0878-3122253

邮　　箱：cxhk_000@163.com

1、样品情况

表 1 样品情况

委托（或受检）单位	武定县城市建设开发投资有限公司	采样地点	详见监测结果一览表
样品类型	地表水、环境空气	采样方式	监测方现场取样
样品数量	环境空气：二氧化硫日均浓度样品 15 个，小时浓度样品 49 个；二氧化氮日均浓度样品 15 个，小时浓度样品 49 个；一氧化氮小时浓度样品 49 个；TSP 日均浓度样品 15 个；PM_{10} 日均浓度样品 15 个。 地表水环境：42 个。	保存方式	常温保存
采样时间	2016 年 11 月 21-24 日	采样人	环境空气敏感点：刘云伟、施国飞、张文荣； 项目周界无组织：蔡永刚、高雁海、胡元林、郭文俊； 地表水：张彪、华剑宏、李怡青
送样时间	环境空气：2016 年 11 月 22-24 日 周界无组织：2016 年 11 月 22-24 日 地表水：2016 年 11 月 21-23 日	送样人	环境空气敏感点：施国飞、张文荣； 项目周界无组织：蔡永刚、高雁海、胡元林、郭文俊； 地表水：张彪、华剑宏、李怡青
接样时间	环境空气：2016 年 11 月 22-24 日 周界无组织：2016 年 11 月 22-24 日 地表水：2016 年 11 月 21-23 日	接样人	何汝军、叶宇航
分析时间	2016 年 11 月 21-28 日	分析人员	二氧化硫：罗光丹、何汝军 二氧化氮：杨晓龙、罗琼芬 颗粒物、TSP 及 PM_{10}：高雁海 地表水：周宇晖、王敏、甘晓、段如晓、罗应菊、张彪、华剑宏、李怡青
样品状态描述	样品状态符合监测规范、标签完整		

2、 监测项目、方法、设备

表 2 监测分析方法及主要仪器一览表

监测项目	监测方法	监测和分析设备	仪器编号	方法检出限
pH	便携式 pH 计法《水和废水监测分析方法》（第四版）国家环境保护总局（2002 年）	便携式多参数测定仪 Multi3420	JL-28 JL-143	——
溶解氧	水质 溶解氧的测定 电化学探头法 （HJ506-2009）	便携式多参数测定仪 Multi3420	JL-28 JL-143	0.1（mg/L）
悬浮物	水质 悬浮物的测定 重量法 （GB11901-89）	CPA 225D 电子天平	JL-01	100mL 4mg/L 1000mL 0.4mg/L
高锰酸盐指数	水质 高锰酸盐指数的测定 （GB11892-89）	酸式滴定管	——	0.5（mg/L）
五日生化需氧量（BOD_5）	水质 五日生化需氧量（BOD_5）的测定 稀释与接种法 （HJ505-2009）	LRH-250A 生化培养箱 便携式多参数测定仪 Multi3430	FZ-05 JL-143	0.5（mg/L）
氨氮	水质 氨氮的测定 纳氏试剂分光光度法（HJ535-2009）	UV-1750 紫外可见分光光度计	JL-12	0.025（mg/L）
石油类	水质 石油类和动植物油类的测定 红外光度法 （HJ637-2012）	OiL460 型红外分光测油仪	JL-125	0.01（mg/L）
化学需氧量	水质 化学需氧量（COD）的测定 重铬酸盐法（GB11914-89）	HCA-101 COD 消解器 酸式滴定管	FZ-87-89	10（mg/L）

总氮	水质 总氮的测定 碱性过硫酸钾消解紫外分光光度法（HJ636-2012）	UV-1750 紫外可见分光光度计	JL-12	0.05（mg/L）
总磷	水质 总磷的测定 钼酸铵分光光度法（GB11893-89）	T6 紫外可见分光光度计	JL-25	0.01（ mg/L）
阴离子表面活性剂	水质 阴离子表面活性剂的测定 亚甲蓝分光光度法（GB7494—87）	T6 紫外可见分光光度计	JL-25	0.05（mg/L）
粪大肠菌群	水质 粪大肠菌群的测定 多管发酵法和滤膜法（HJ/T 347-2007）（试行）多管发酵法	SW-CT-2FD 洁净工作台 LRH-150B 生化培养箱 DHP-360 型电热恒温培养箱	FZ-35 FZ-29 FZ-36	2（MPN/L）
二氧化硫（SO_2）小时浓度	环境空气 二氧化硫的测定 甲醛吸收-副玫瑰苯胺分光光度法（HJ 482-2009）	中流量空气颗粒物采样器 TH-1500CIII 恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C 722s 分光光度计 大气采样器 ZR-3500	JL-112 JL-113 JL-119 JL-120	0.007（mg/m³）
二氧化氮（NO_2）小时浓度	环境空气 氮氧化物（一氧化氮和二氧化氮）的测定 盐酸萘乙二胺分光光度法（HJ479-2009）			0.005（mg/m³）
氮氧化物（NO_x）小时浓度				
二氧化硫（SO_2）日均浓度	环境空气 二氧化硫的测定 甲醛吸收-副玫瑰苯胺分光光度法（HJ 482-2009）	恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C		0.028（mg/m³）

二氧化氮（NO_2）日均浓度 氮氧化物（NO_x）日均浓度	环境空气 氮氧化物（一氧化氮和二氧化氮）的测定 盐酸萘乙二胺分光光度法（HJ479-2009）	722s 分光光度计	JL-154 JL-155 JL-156 JL-157 JL-158	0.003（mg/m^3）
总悬浮颗粒物（TSP） 颗粒物	环境空气 总悬浮颗粒物的测定 重量法（GB/T15432-1995）	中流量空气颗粒物采样器 TH-1500CIII 恒温大气采样器 TH-3000BIV 大流量采样器 TH-1000C MS204S 电子天平	JL-113 JL-120 JL-112 JL-119 JL-131 JL-144 JL-145	0.001（mg/m^3）
可吸入颗粒物（PM_{10}）	环境空气中 PM_{10} 和 $PM_{2.5}$ 的测定 重量法（HJ618-2011）		JL-146 JL-147 JL-148 JL-150 JL-151 JL-152 JL-132	0.001（mg/m^3）
环境噪声	《声环境质量标准》（GB3096-2008）	AWA6228 多功能声级计 AWA6221A 声校准器	JL-134 JL-135 JL-107	——
建筑施工场界环境噪声	《建筑施工场界环境噪声排放标准》（GB12523-2011）	AWA6228 多功能声级计 AWA6221A 声校准器	JL-134 JL-135 JL-107	——

3、 监测结果

表3　地表水监测结果一览表

监测日期	监测点位（样品编号）	监测项目（含单位）及结果											
		pH	阴离子表面活性剂	石油类	悬浮物	高锰酸盐指数	总氮	氨氮	总磷	粪大肠菌群	溶解氧	五日生化需氧量	化学需氧量
		无量纲	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	个/L	mg/L	mg/L	mg/L
2016年11月21日	CWD3包(城北路)跨楚马龙河1号中桥上游50米（DS201613001）	8.01	0.05L	0.01L	12	0.9	1.89	0.234	0.06	≥24000	7.9	1.0	10L
	CWD3包(城北路)跨楚马龙河1号中桥下游100米（DS201613002）	8.05	0.05L	0.01L	16	1.0	2.14	0.254	0.06	≥24000	8.0	1.0	10L
	CWD4-2包（牡丹路）跨楚马龙河2号中桥上游50米（DS201613003）	8.04	0.05L	0.01L	12	1.0	2.01	0.267	0.06	≥24000	8.0	1.1	10L
	CWD4-2包（牡丹路）跨楚马龙河2号中桥下游100米（DS201613004）	8.08	0.08	0.01L	14	1.1	2.72	0.636	0.11	≥24000	7.8	2.2	10L
	CWD2包(武康路)跨楚马龙河3号中桥上游50米（DS201613005）	8.08	0.09	0.01L	13	1.2	2.43	0.530	0.10	≥24000	7.8	1.9	10L
	CWD2包(武康路)跨楚马龙河3号中桥下游100米（DS201613006）	8.06	0.09	0.01L	14	1.1	2.83	0.607	0.10	≥24000	7.7	2.3	10L
	CWD1包（北城大道）跨楚马龙河4号中桥上游50米（DS201613007）	8.08	0.09	0.01L	14	1.2	2.71	0.754	0.10	≥24000	7.8	3.6	10L
	CWD1包（北城大道）跨楚马龙河4号中桥下游100米（DS201613008）	8.08	0.14	0.01L	13	1.3	3.24	1.28	0.14	≥24000	7.6	4.3	11.1
	CWD4-2包（滨河路）跨楚马龙河5号中桥上游50米（DS201613009）	8.10	0.14	0.01L	16	1.3	3.68	1.28	0.16	≥24000	7.4	4.5	10.5
	CWD4-2包（滨河路）跨楚马龙河5号中桥下游100米（DS201613010）	7.97	0.12	0.01L	25	2.1	4.12	2.08	0.14	≥24000	6.9	4.9	13.1
	CWD4-2包（牡丹路）跨楚果园河中桥上游50米（DS201613011）	7.89	0.10	0.01L	27	2.0	3.63	2.04	0.14	≥24000	6.8	3.2	11.9
	CWD4-2包（牡丹路）跨楚果园河中桥下游100米（DS201613012-1）	7.91	0.10	0.01L	30	1.9	3.84	1.98	0.14	≥24000	6.8	4.1	10.7
2016年11月22日	CWD3包(城北路)跨楚马龙河1号中桥上游50米（DS201613013）	7.95	0.05L	0.01L	10	1.0	1.76	0.208	0.06	≥24000	8.6	0.9	10L
	CWD3包(城北路)跨楚马龙河1号中桥下游100米（DS201613014）	7.97	0.05L	0.01L	18	1.1	2.23	0.272	0.06	≥24000	8.7	1.1	10L
	CWD4-2包（牡丹路）跨楚马龙河2号中桥上游50米（DS201613015）	8.01	0.05L	0.01L	9	1.1	2.00	0.257	0.06	≥24000	8.8	1.2	10L
	CWD4 2包（牡丹路）跨楚马龙河2号中桥下游100米（DS201613016）	7.99	0.09	0.01L	18	1.1	2.69	0.705	0.12	≥24000	8.6	2.4	10L
	CWD2包(武康路)跨楚马龙河3号中桥上游50米（DS201613017）	7.98	0.09	0.01L	12	1.2	2.29	0.736	0.10	≥24000	8.5	2.1	10L
	CWD2包(武康路)跨楚马龙河3号中桥下游100米（DS201613018）	7.99	0.09	0.01L	14	1.2	2.81	0.829	0.10	≥24000	8.4	2.4	10L
	CWD1包（北城大道）跨楚马龙河4号中桥上游50米（DS201613019）	7.85	0.09	0.01L	12	1.2	2.64	0.625	0.11	≥24000	8.7	3.9	10L
	CWD1包（北城大道）跨楚马龙河4号中桥下游100米（DS201613020）	7.97	0.13	0.01L	16	1.3	3.35	0.862	0.13	≥24000	8.5	4.5	11.2

续表

监测日期	监测点位(点位编号)	监测项目（含单位）及结果											
		pH	阴离子表面活性剂	石油类	悬浮物	高锰酸盐指数	总氮	氨氮	总磷	粪大肠菌群	溶解氧	五日生化需氧量	化学需氧量
		无量纲	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	个/L	mg/L	mg/L	mg/L
2016年11月22日	CWD4-2包（滨河路）跨越马龙河5号中桥上游50米（DS201613021）	8.03	0.14	0.01L	16	1.2	3.72	1.53	0.15	≥24000	8.1	4.4	10.2
	CWD4-2包（滨河路）跨越马龙河5号中桥下游100米（DS201613022）	7.86	0.12	0.01L	28	2.2	4.13	1.85	0.14	≥24000	7.2	4.8	13.2
	CWD4-2包（牡丹路）跨越果园河中桥上游50米（DS201613023）	7.93	0.10	0.01L	13	2.1	3.51	1.88	0.14	≥24000	7.4	3.3	11.9
	CWD4-2包（牡丹路）跨越果园河中桥下游100米（DS201613024-1）	7.88	0.10	0.01L	33	2.0	3.74	1.95	0.14	≥24000	7.3	4.4	11.2
2016年11月23日	CWD3包（城北路）跨越马龙河1号中桥上游50米（DS201613025）	7.95	0.05L	0.01L	16	0.9	1.68	0.231	0.06	≥24000	8.5	0.8	10L
	CWD3包（城北路）跨越马龙河1号中桥下游100米（DS201613026）	7.96	0.05L	0.01L	11	0.9	2.26	0.301	0.06	≥24000	8.5	0.9	10L
	CWD1-2包（迁行路）跨越马龙河2号中桥上游50米（DS201613027）	8.04	0.05L	0.01L	14	1.0	2.08	0.280	0.06	≥24000	8.8	1.2	10L
	CWD4-2包（牡丹路）跨越马龙河2号中桥下游100米（DS201613028）	7.98	0.09	0.01L	11	1.2	2.71	0.728	0.11	≥24000	8.5	2.0	10L
	CWD2包（武侯路）跨越马龙河3号中桥上游50米（DS201613029）	8.02	0.10	0.01L	14	1.1	2.27	0.772	0.11	≥24000	8.5	1.7	10L
	CWD2包（武侯路）跨越马龙河3号中桥下游100米（DS201613030）	7.33	0.10	0.01L	11	1.2	2.63	0.857	0.11	≥24000	8.4	2.2	10L
	CWD1包（北城大道）跨越马龙河4号中桥上游50米（DS201613031）	8.06	0.08	0.01L	12	1.2	2.82	0.628	0.11	≥24000	8.6	3.1	10L
	CWD1包（北城大道）跨越马龙河4号中桥下游100米（DS201613032）	8.01	0.14	0.01L	11	1.3	3.43	0.911	0.14	≥24000	8.4	4.2	10.6
	CWD4-2包（滨河路）跨越马龙河5号中桥上游50米（DS201613033）	8.00	0.14	0.01	13	1.4	3.57	1.51	0.17	≥24000	8.2	4.5	10.3
	CWD4-2包（滨河路）跨越马龙河5号中桥下游100米（DS201613034）	7.88	0.13	0.01L	11	2.0	4.18	1.92	0.18	≥24000	6.0	4.9	12.9
	CWD4-2包（牡丹路）跨越果园河中桥上游50米（DS201613035）	7.92	0.12	0.01L	15	1.9	3.64	1.96	0.14	≥24000	7.3	3.0	11.1
	CWD4-2包（牡丹路）跨越果园河中桥下游100米（DS201613036-1）	7.89	0.12	0.01L	10	1.9	3.87	1.89	0.14	≥24000	7.3	4.0	10.7

备注：低于项目方法检出限的结果，结果上报方式为“检出限L”。

表 4 施工场地边界外无组织排放监测结果一览表

样品类别	采样地点	监测日期	时段	SO_2（mg/标 m^3）	NO_2（mg/标 m^3）	颗粒物（mg/m^3）
施工场地边界外无组织排放	整个项目区域施工现场边界外无组织排放浓度监控点北衙社区	2016 年 11 月 22 日	09:00-10:00	0.018	0.018	0.130
			11:00-12:00	0.026	0.021	0.356
			14:00-15:00	0.019	0.015	0.070
			16:00-17:00	0.016	0.017	0.116
		2016 年 11 月 23 日	09:00-10:00	0.038	0.015	0.289
			11:00-12:00	0.039	0.015	0.111
			14:00-15:00	0.014	0.017	0.136
			16:00-17:00	0.011	0.012	0.068
		2016 年 11 月 24 日	09:00-10:00	0.019	0.020	0.523
			11:00-12:00	0.014	0.021	0.356
			14:00-15:00	0.016	0.021	0.545
			16:00-17:00	0.011	0.024	0.349
	整个项目区域施工现场边界外无组织排放浓度监控点旧城社区	2016 年 11 月 22 日	09:00-10:00	0.012	0.011	0.391
			11:00-12:00	0.027	0.011	0.283
			14:00-15:00	0.018	0.016	0.070
			16:00-17:00	0.023	0.016	0.023
		2016 年 11 月 23 日	09:00-10:00	0.020	0.014	0.362
			11:00-12:00	0.019	0.015	0.217
			14:00-15:00	0.014	0.012	0.116
			16:00-17:00	0.012	0.012	0.023
		2016 年 11 月 24 日	09:00-10:00	0.012	0.020	0.304
			11:00-12:00	0.021	0.018	0.391
			14:00-15:00	0.011	0.015	0.114
			16:00-17:00	0.010	0.014	0.091
	整个项目区域施工现场边界外无组织排放浓度监控点武定县政协	2016 年 11 月 22 日	09:00-10:00	0.014	0.015	0.674
			11:00-12:00	0.018	0.014	0.244
			14:00-15:00	0.017	0.014	0.349
			16:00-17:00	0.014	0.013	0.227
		2016 年 11 月 23 日	09:00-10:00	0.042	0.015	0.783
			11:00-12:00	0.039	0.015	0.622
			14:00-15:00	0.019	0.011	0.318
			16:00-17:00	0.013	0.011	0.250
		2016 年 11 月 24 日	09:00-10:00	0.020	0.020	0.413
			11:00-12:00	0.025	0.021	0.689
			14:00-15:00	0.020	0.014	0.204
			16:00-17:00	0.015	0.017	0.159
	整个项目区域施工现场边界外无组织排放浓度监控点百和村委会	2016 年 11 月 22 日	09:00-10:00	0.022	0.017	0.454
			11:00-12:00	0.020	0.018	0.591
			14:00-15:00	0.019	0.016	0.232
			16:00-17:00	0.018	0.017	0.256
		2016 年 11 月 23 日	09:00-10:00	0.027	0.016	0.409
			11:00-12:00	0.034	0.020	0.659
			14:00-15:00	0.014	0.017	0.256
			16:00-17:00	0.015	0.012	0.116
		2016 年 11 月 24 日	09:00-10:00	0.019	0.022	0.318
			11:00-12:00	0.038	0.024	0.432
			14:00-15:00	0.021	0.018	0.256
			16:00-17:00	0.017	0.026	0.163

表 5 环境空气敏感点监测结果一览表

样品类别	采样地点	检测日期	TSP（ug/m³）	PM_{10}（ug/m³）	SO_2（ug/标 m³）	NO_2（ug/标 m³）
环境空气	西和村	2016 年 11 月 22 日	128	89	8	6
		2016 年 11 月 23 日	150	106	7	5
		2016 年 11 月 24 日	132	103	7	5
	恩源实验学校	2016 年 11 月 22 日	131	105	7	9
		2016 年 11 月 23 日	140	92	7	4
		2016 年 11 月 24 日	241	98	7	5
	旧城社区	2016 年 11 月 22 日	174	129	7	5
		2016 年 11 月 23 日	177	124	7	5
		2016 年 11 月 24 日	201	149	8	6
	县中医院	2016 年 11 月 22 日	154	111	7	6
		2016 年 11 月 23 日	188	96	8	5
		2016 年 11 月 24 日	226	162	7	5
	白邑村	2016 年 11 月 22 日	209	137	10	5
		2016 年 11 月 23 日	271	171	8	5
		2016 年 11 月 24 日	257	175	9	7

表 6 施工场界噪声监测结果一览表

监测点位	监测结果 单位：dB（A）					
	2016 年 11 月 22 日			2016 年 11 月 23 日		
	昼间	夜间	夜间（max）	昼间	夜间	夜间（max）
西和村委会	57	47	74	57	48	74
县政协	66	60	78	68	65	87
旧城社区	52	52	71	54	51	82
北街社区	52	45	70	51	47	76

表 7 声环境敏感点噪声监测结果一览表

监测点位	监测结果 单位： dB（A）			
	2016 年 11 月 22 日		2016 年 11 月 23 日	
	昼 间	夜 间	昼 间	夜 间
西和村	56	54	57	47
思源实验学校	53	44	50	47
县中医院	55	54	64	48
白邑村	57	43	53	46
旧城社区	54	53	54	52

4 、监测结果评价

（1）地表水：参照《地表水环境质量标准》（GB3838-2002）及《地表水环境质量评价办法(试行)》（2011），本次所监测 12 个地表水断面水质评价结果见表 8。

表 8 地表水断面水质监测评价结果一览表

监测点位（断面）名称	评价结果	主要污染物
CWD3 包(城北路)跨越乌龙河 1 号中桥上游 50 米	符合 IV 类标准	——
CWD3 包(城北路)跨越乌龙河 1 号中桥下游 100 米	符合 IV 类标准	——
CWD4-2 包（牡丹路）跨越乌龙河 2 号中桥上游 50 米	符合 IV 类标准	——
CWD4-2 包（牡丹路）跨越乌龙河 2 号中桥下游 100 米	符合 IV 类标准	——
CWD2 包(武续路)跨越乌龙河 3 号中桥上游 50 米	符合 IV 类标准	——
CWD2 包(武续路)跨越乌龙河 3 号中桥下游 100 米	符合 IV 类标准	——
CWD1 包（北城大道）跨越乌龙河 4 号中桥上游 50 米	符合 IV 类标准	——
CWD1 包（北城大道）跨越乌龙河 4 号中桥下游 100 米	劣于 IV 类标准	氨氮、五日生化需氧量、粪大肠菌群
CWD4-2 包（滨河路）跨越乌龙河 5 号中桥上游 50 米	劣于 IV 类标准	氨氮、五日生化需氧量、粪大肠菌群
CWD4-2 包（滨河路）跨越乌龙河 5 号中桥下游 100 米	劣于 IV 类标准	氨氮、五日生化需氧量、粪大肠菌群
CWD4-2 包（牡丹路）跨越菜园河中桥上游 50 米	劣于 IV 类标准	氨氮、粪大肠菌群
CWD4-2 包（牡丹路）跨越菜园河中桥下游 100 米	劣于 IV 类标准	氨氮、五日生化需氧量、粪大肠菌群

（2）施工场地边界外无组织排放：参照《大气污染物综合排放标准》（GB16297-1996）的表 2 中无组织排放监控浓度限值进行评价，评价结果见表 9。

表 9 施工场地边界外无组织排放浓度监测点评价结果一览表

评价结果 / 日期 / 点位	11 月 22 日	11 月 23 日	11 月 24 日
西和村委会	符合标准	符合标准	符合标准
县政协	符合标准	符合标准	符合标准
旧城社区	符合标准	符合标准	符合标准
北街社区	符合标准	符合标准	符合标准

（3）环境空气敏感点：参照《环境空气质量标准》（GB3095-2012）的表 1 中二级标准进行评价，评价结果见表 10。

表 10 环境空气敏感点评价结果一览表

评价结果 / 日期 / 点位	11 月 22 日	11 月 23 日	11 月 24 日
西和村	符合二级标准	符合二级标准	符合二级标准
思源实验学校	符合二级标准	符合二级标准	符合二级标准
县中医院	符合二级标准	符合二级标准	劣于二级标准
旧城社区	符合二级标准	符合二级标准	符合二级标准
白邑村	符合二级标准	劣于二级标准	劣于二级标准

（4）施工场界噪声：参照《建筑施工场界环境噪声排放标准》（GB12523-2011）的表 1 中规定的排放限值对施工场界噪声监测点进行评价，评价结果见表 11。

表 11 施工场界噪声监测点评价结果一览表

评价结果 点位 \ 日期（时段）	2016 年 11 月 22 日			2016 年 11 月 23 日		
	昼间	夜间	夜间（max）	昼间	夜间	夜间（max）
西和村委	符合标准	符合标准	劣于标准	符合标准	符合标准	劣于标准
县政协	符合标准	劣于标准	劣于标准	符合标准	劣于标准	劣于标准
旧城社区	符合标准	劣于标准	劣于标准	符合标准	劣于标准	劣于标准
北街社区	符合标准	符合标准	符合标准	符合标准	符合标准	劣于标准

（5）声环境：参照《声环境质量标准》（GB3096-2008）的表 1 中 2 类声环境功能区标准进行评价，评价结果见表 12。

表 12 声环境敏感点评价结果一览表

评价结果 点位 \ 日期（时段）	2016 年 11 月 22 日		2016 年 11 月 23 日	
	昼间	夜间	昼间	夜间
西和村	符合 2 类标准	劣于 2 类标准	符合 2 类标准	符合 2 类标准
思源实验学校	符合 2 类标准	符合 2 类标准	符合 2 类标准	符合 2 类标准
县中医院	符合 2 类标准	劣于 2 类标准	劣于 2 类标准	符合 2 类标准
旧城社区	符合 2 类标准	符合 2 类标准	符合 2 类标准	符合 2 类标准
白邑村	符合 2 类标准	劣于 2 类标准	符合 2 类标准	劣于 2 类标准

5、 附件：监测委托单

编制：施国飞 日期：2016 年 12 月 7 日

校核：高维峰 日期：2016 年 12 月 12 日

审核：刘树伟 日期：2016 年 12 月 14 日

批准：周宇晖 日期：2016 年 12 月 19 日

表 11 施工场界噪声监测点评价结果一览表

评价结果 / 日期（时段） / 点位	2016 年 11 月 22 日			2016 年 11 月 23 日		
	昼间	夜间	夜间（max）	昼间	夜间	夜间（max）
西和村委	符合标准	符合标准	劣于标准	符合标准	符合标准	劣于标准
县政协	符合标准	劣于标准	劣于标准	符合标准	劣于标准	劣于标准
旧城社区	符合标准	劣于标准	劣于标准	符合标准	劣于标准	劣于标准
北街社区	符合标准	符合标准	符合标准	符合标准	符合标准	劣于标准

（5）声环境：参照《声环境质量标准》（GB3096-2008）的表 1 中 2 类声环境功能区标准进行评价，评价结果见表 12。

表 12 声环境敏感点评价结果一览表

评价结果 / 日期（时段） / 点位	2016 年 11 月 22 日		2016 年 11 月 23 日	
	昼间	夜间	昼间	夜间
西和村	符合 2 类标准	劣于 2 类标准	符合 2 类标准	符合 2 类标准
思源实验学校	符合 2 类标准	符合 2 类标准	符合 2 类标准	符合 2 类标准
县中医院	符合 2 类标准	劣于 2 类标准	劣于 2 类标准	符合 2 类标准
旧城社区	符合 2 类标准	符合 2 类标准	符合 2 类标准	符合 2 类标准
白邑村	符合 2 类标准	劣于 2 类标准	符合 2 类标准	劣于 2 类标准

5、 附件：监测委托单

编制：施国飞 日期：2016 年 12 月 7 日

校核：高维海 日期：2016 年 12 月 12 日

审核：刘洪涛 日期：2016 年 12 月 14 日

批准：周学明 日期：2016 年 12 月 19 日