



# Environmental Monitoring Report

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Project Number: 31624  
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## Nep: Melamchi Water Supply Project—Kathmandu Valley Water Supply and Sanitation Subproject 2

Prepared by:

Government of Nepal

Kathmandu Valley Water Supply Management Board

For: Ministry of Physical Planning and Works (MPPW)  
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**Asian Development Bank**

**Government of Nepal**  
Melamchi Water Supply Board

**Asian Development Bank**  
Project Loan Number: 2059-NEP

# **Melamchi Water Supply project**

**Kathmandu Valley Water Supply and Sanitation  
Subproject (Subproject-2)**

**Environmental Management  
Plan (EMP)**

**Project Management Unit (PMU)  
Kathmandu Valley Water Supply Management Board (KVWSMB/KUKL)**

The Environmental Management Plan is a document of borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, and Staffs and may be preliminary in nature.

**July 2008**

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### Abbreviations

ADB	: Asian Development Bank
AIDS	: Acquired Immune Deficiency Syndrome
BDS	: Bulk Distribution System
BS	: Bikram Sambat
dba	: Decibel (A)
DDC	: District Development Committee
DIZ	: Direct Impact Zone
DNI	: Distribution Network Improvement
DWEC	: District Wage Evaluation Committee
EIA	: Environmental Impact Assessment
EMEP	: Environment Mitigation Execution Plan
EMO	: Environment Management Office
EMP	: Environmental Management Program
GoN	: Government of Nepal
HIV	: Human Immunodeficiency Virus
IIZ	: Indirect Impact Zone
IUCN	: The World Conservation Union
JBIC	: Japan Bank for International Cooperation
JICA	: Japan International Cooperation Agency
km	: Kilometer
KUKL	: Kathmandu Upatyaka Khanepani Limited
KVWSMB	: Kathmandu Valley Water Supply Management Board
LPG	: Liquefied Petroleum Gas
MLD	: Million litres per day
MOEST	: Ministry of Environment, Science and Technology
MPPW	: Ministry of Physical Planning and Works
MWSDB	: Melamchi Water Supply Development Board
MWSP	: Melamchi Water Supply Project
NAAQS	: National Ambient Air Quality Standard
NGO	: Non-Government Organization
NRs	: Nepali Rupees (Nepali Currency)
NTFP	: Non Timber Forest Product
PAF	: Project Affected Family
PM <sub>10</sub>	: Particulate Matter (Smaller than 10 microns in diameter)
PMU	: Project Management Unit
PPE	: Personal Protective Equipment
RAP	: Resettlement Action Plan
SAPI	: Special Assistance for Project Implementation
SE	: Supervision Engineers
SOW	: Scope of Work

SPAF	: Severely Project Affected Family
STD	: Sexually Transmitted Disease
TSP	: Total Suspended Particulates
VAT	: Value Added Tax
WDT	: Water Diversion Tunnel
WSDNI	: Water Supply Distribution Network Improvement
WTP	: Water Treatment Plant

## **BACKGROUND OF THE PROJECT**

The Melamchi Water Supply Project (MWSP) covers a part of Indrawati and Bagmati watershed and includes areas of five districts. The key water diversion facilities are located within Sindhupalchowk and Kavrepalanchowk districts, whereas, water treatment plant, water distribution and the ancillary structures, will be located within Kathmandu valley. MWSP is a comprehensive water supply project that aims to improve the health and well being of the people of Kathmandu Valley by diverting water from Melamchi River and alleviating the shortage of potable water.

MWSP comprises four parts: (i) infrastructure development (ii) social and environmental support (iii) institutional reforms and (iv) project implementation support. The Environmental Impact Assessment of the project was undertaken and was approved in 2000. Accordingly, an Environmental Management Plan (EMP) was developed and was approved in 2001 for implementation.

Asian Development Bank (ADB) approved a loan on 21<sup>st</sup> December, 2000 and it was effective from 28<sup>th</sup> November, 2001. After 6<sup>th</sup> year of project implementation, ADB and Government of Nepal, recognized that it was necessary to change the scopes of project implementation arrangement by splitting the MWSP into the following two distinct Subprojects; (i) the Melamchi River Water Diversion Subproject (Subproject - 1) covering all project activities in Melamchi Valley including constructions of Water Diversion Tunnel (WDT) and Water Treatment Plant (WTP) and (ii) Kathmandu Valley Water Supply and Sanitation Subproject (Subproject -2).

Subproject- 2 comprises:

- a) Construction of a bulk distribution system (BDS) comprising service reservoirs strategically located in the Kathmandu Valley and bulk water supply pipelines leading to the reservoirs from the water treatment plant;
- b) Rehabilitation and improvement of distribution networks at primary, secondary, and tertiary levels, and house connections and the rehabilitation and improvement of existing water supply system including intakes, transmission mains, water treatment plants and service reservoirs;
- c) Improvements of waste water system in a phased manner; and
- d) Development of a shallow ground water well field at Manohara within the Kathmandu Valley to extract, treat, and distribute about 15 MLD and 25 MLD of water in dry and wet season, respectively.

The Special Assistance for Project Implementation (SAPI Phase II) study carried out by JBIC in 2004 recommended that the number of additional service reservoirs should be minimized. Water from existing systems and from the Melamchi water treatment plant should be distributed separately to different supply areas in view of simplifying the operation and maintenance of the water supply system. The original BDS schemes should be implemented in stages corresponding to the actual development of urbanization in Kathmandu Valley. Therefore, the recommendation for the first stage is to limit the development to the construction of two service

reservoirs, namely Mahankalchour-2 (30,000 m<sup>3</sup>) and Bansbari-2 (10,000 m<sup>3</sup>) plus transmission mains required to connect these reservoirs to the water treatment plant.

The main components of Water Supply Distribution Network Improvement (DNI) include:

- rehabilitation of existing water supply pipelines,
- development of new water supply networks,
- improvement of water supply networks junctions integrating into the existing pipelines,
- replacement of water supply valves for network operation, and
- removal of existing spaghetti connection and replacement of existing cluster connection with tertiary pipelines of the new networks.

Demonstration sites have been established at two places in Kathmandu Valley for the implementation of WSDNI in order to rehabilitate and improve the existing distribution networks, to reduce the water loss due to leakage, and to prevent the contamination in the water supply distribution system.

The Subproject-2 also includes activity to improve the existing drainages and sewerage system, which comprises improvement of roadside drainage and on-site sanitation in order to reduce the contamination of water supply system. The activity includes the following;

- minimization of defecation in open and river side,
- reduction in disposal of waste water in the river side drainages, and
- reduction in potential threat to water quality of underground tank due to the leakage of waste water from septic tanks and soak pit or pit latrine.

The implementation responsibility for subproject-2 has been transferred from MWSDB to a water utility operator named Kathmandu Upatyeka Khanepani Limited (KUKL), which will operate the water service system within the Kathmandu Valley as per the operating license issued by Kathmandu Valley Water Supply Management Board (KVWSMB). KUKL will implement the infrastructure constructions and rehabilitations under Subproject-2.

EMP implementation is required for Subproject-2 also as per EIA and EMP of MWSP, 2000 and 2001 respectively.

The Project was subjected to EIA in 2000 and was approved by the then Ministry of Environment and Population of the Government of Nepal and ADB. The Subproject-2 has not introduced any new infrastructure requiring a separate environmental examination. It is rather a scaled down version of the Bulk Distribution System (BDS) and Distribution Network Improvement (DNI) works included in the original MWSP. The environmental assessment, mitigation prescriptions and monitoring plan given in EIA Report of 2000 are still valid. Hence, there is no need of undertaking new EIA for Subproject-2 of MWSP.

The following description represents an updated Environmental Management Plan (EMP) of Subproject -2 developed on the basis of ADB's Environmental Assessment Guidelines, 2003 (Section VI: Environmental Management Plan (EMP), Pp 52-55).

## **1.0 SUMMARY OF POTENTIAL IMPACTS**

### **1.1 Physical Environment**

The project area is classified as i) Direct Impact Zone (DIZ) within the periphery of 500 m from the main project site and ii) the Indirect Impact Zone (IIZ) beyond 500 m from the project sites (IUCN, 1999). At several places, within Kathmandu, Bhaktapur and Lalitpur districts, Water Supply Distribution Networks will have to be established.

*Soil Erosion/Sedimentation/Slope Instability:* Impacts likely to occur from the improvement and construction of water distribution networks may include operation of quarry sites which may induce soil erosion, landslides, siltation and sedimentation. Haphazard disposal of spoil materials may create erosion problems, disturbances to the existing drainage lines, and changes in the existing land use practices.

*River Morphology, Hydrology and Water Pollution:* During construction, rehabilitation improvement and operation of water distribution networks, there will be some impacts in the river hydrology. Water pollution problems may occur because of the dumping of spoil materials into the river, excavation of the boulders from the river channel, direct disposal of liquid wastes, and leakage of oil and lubricants and may affect the downstream river hydrology particularly during dry season.

*Impact on Air quality and Noise level:* Excavation of construction materials, aggregate crushing, drilling, quarrying and plying of vehicles may produce hydrocarbons, CO, CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, TSP, H<sub>2</sub>S, CH<sub>4</sub> etc. Plying of trucks in non-metallic roads may produce huge amount of dust. These may also increase the noise level above 90 dBA.

### **1.2 Biological Environment**

*Ecological Impacts:* Although most of the construction and improvement works will take place in urban area, however, there will be some effects on the existing trees and vegetation and as a consequence, some urban biodiversity will be affected.

### **1.3 Socio-Economic and Cultural Environment**

*Socio-Economic and Cultural Impacts:* as per the approved EIA of 2000, approximately 1,100 workers were estimated to be employed every day for the construction and improvement of Water Supply Networks. About 60 percent of the workers required for the project were estimated to be available locally, and at least 30 percent of the workers should be local and 5 percent should be women.

*Crime level, Local service, and Traffic Congestion:* Alcohol abuse, gambling, prostitution and other social disharmony are likely to arise in the construction site. Outside workers will come to the project site with their immediate family members. This will create unwanted congestion and exert pressure on the limited local resources. As per

the approved EIA 2000, nearly 90 heavy vehicles will be plying daily for the transport of construction materials possibly creating traffic congestions.

## **2.0 DESCRIPTION OF THE PLANNED MITIGATION MEASURES**

### **2.1 Mitigation Measures during Design Phase**

Following mitigation measures should be adopted during design stage:

#### **i) Soil Erosion/Sedimentation/Slope Instability**

- adequate drainage system should be incorporated in final design,
- suitable measures for handling excessive spoil materials should be incorporated in design,
- proper drainage plan in should be incorporated in final design, and
- suitable measures to stabilize unstable areas should be incorporated in final design.

#### **ii) Vegetation Loss**

- incorporation of measures in design which requires less vegetation clearance.

#### **ii) Solid Waste Problem**

- sludge and solid wastes reduction measures should be incorporated in design.

### **2.2 Mitigation Measures during Preparation for Construction**

Following are the mitigation measures to be adopted during preparation for construction:

#### **i) Acquisition, compensation and resettlements**

- project area should be delineated and list of project affected people should be prepared,
- people should be notified with necessary information regarding acquisition, compensation and resettlements,
- Resettlement Action Plan (RAP) should be prepared,
- compensation of affected land and property should be provided and
- RAP should be implemented.

#### **ii) Preparation of EMEP**

- EMEP should be prepared and approved before the construction activity begins, and
- ensure that all the mitigation measures and monitoring plan have been incorporated in EMEP.

#### **iii) Temporary Land and Property Acquisition**

- temporary areas required by the project should be identified and located with proper marking. Details of temporary land acquisition and affected private properties should be prepared and submit to Supervising Engineer,
- RAP should be followed for temporary acquisition, and

- letters of Approval and or Agreement should be obtained for (i) temporary acquisition of land and properties (ii) relocation of religious site, foot trails, (iii) disruption of water supply and others.

**iv) Delineation and Pegging of Areas Required**

- pegging of all constructions site, labor camp should be clearly done before the commencement of construction, and
- records of trees and other properties likely to be affected should be maintained.

**v) Establishment of Labor Camp**

- establish workforce camp at designated site only.

**vi) Selection of Construction Workers**

- employ local people (not under age 14) especially SPAF, and PAF in jobs, and
- settle wage rate based on DWEC and provide the list of employees to Supervising Engineer.

## **2.3 Mitigation Measures during Construction Phase**

### **2.3.1 Physical Environment**

**i) Soil Erosion/Sedimentation/Slope Instability;**

The construction of various project structures and improvement of Water Supply Distribution Networks may require excavating the soil for construction works and laying of the pipes and also require operation of quarry sites and burrow pits for the aggregates and sands. For the minimization of the impacts due to the above activities, the following mitigation measures are suggested to be followed;

- adopt cut and fill principles wherever possible,
- works should be avoided during monsoon,
- stockpiled materials should be protected and top soil must be reused,
- materials should not be disposed in drainage line,
- gully control and bio-engineering should be applied wherever needed,
- spoil materials should be used in land filling and the excess materials should be disposed at designated spoil tip area,
- proper drainage facilities should be developed,
- aggregates should be procured from already existing quarry sites.

**ii) Change in River Hydrology and River Morphology**

- quarrying/Mining activity in river/streams for extraction of materials required for project shall not be done so as to change the river cross sections and longitudinal profile,
- existing irrigation canal/channel shall not be adversely affected by the project constructions, and
- ensure care of stone spout should be ensured in order not to disturb the existing flow.

**iii) Change in Water Quality**

To minimize the impacts on water quality of Bagmati and Manohara Rivers, the following mitigations are recommended to implement;

- good camping facilities should be provided to the workers,
- good sanitary facility ( toilets, drinking water and washing facilities) should be provided and urination/defecation in open areas, and in waterways should be restricted,
- discharge of the sanitary and toxic liquids, spent oil, burnt lubricating oil, grease, lubricants, grouting chemicals etc., in land and in the water bodies from the construction works should be prohibited,
- proper storage of aggregates, construction materials, toxic materials, chemical containers, empty bags, and packaging materials and proper disposal of chemical containers, packaging materials plastic bags,
- Waste should be disposed in the designated areas only,
- waste treatment facilities and dumping site should be provided,
- training should be provided to workforce on safe handling of toxic materials, and
- excessive mining in the river bed should be avoided.

#### **iv) Change in Air Quality**

The following measures should be adopted to control air pollution:

- water should be regularly sprinkled during dry season to arrest the dust (three times a day),
- speed limit should be defined for vehicles plying over,
- compliance of project vehicles with National Mass Emission Standard, 2056 B.S.,
- vehicles and equipment should be regularly maintained,
- disposal of excess materials in safe place,
- loose stockpile should be covered, and
- proper ventilation should be arranged in confined working areas.

#### **v) Noise and Vibration**

The following measures should be adopted to control noise and vibration

- mufflers should be fitted to all noisy equipment,
- speed limit should be defined for construction vehicle,
- light-horn should be used in vehicles,
- all equipment should be maintained,
- operation of crusher should be stopped between 7 PM - 6 AM, and
- compensation should be provided for damaged structures caused by vibration.

#### **vi) Soil Quality Change**

- reusable top soil should be stockpiled properly in safe yard.

#### **vii) Solid Waste**

- all materials, toxic, non-toxic and hazardous materials should be stored in safe place (warehouse), and
- waste should be collected, segregated and disposed at designated area.

### **2.3.2 Biological Environment**

**i) Change in Vegetation Structure and Diversity**

Vegetation clearance is required during (i) road construction and (ii) quarry site operation, etc. Prior to the clearance for construction, the area should be pegged. Within the pegged area, the trees should be cleared only if it is absolutely essential. Loss of forest also involves due to the exploitation of construction workers.

Therefore, the contractor has to enforce the following rules:

- only the marked trees should be cut,
- no trees should be cleared from local forest for timber and fuel wood,
- illegal NTFPs collection and trade should be prohibited,
- felled trees should be stockpiled and permission must be required from concerned authority for its use,
- LPG or kerosene should be provided to workforce for cooking ,
- compensatory plantation should be carried out at the rate of 5 for every tree cut and
- affected private owners and community forestry should be compensated.

**2.3.3 Socio-Economic and Cultural Environment****i) Compensation, Resettlement and Rehabilitation**

The resettlement and rehabilitation policy of MWSP includes the following;

- involuntary displacement should be avoided,
- full cost of compensation/relocation/resettlement should be provided,
- upon displacement, all possible assistances should be provided until the displaced people are settled,
- disturbance and rehabilitation costs should be provided,
- traditional rights should be protected,
- employment opportunity should be given to the local people. In case of loss of houses, and structures, DDC will fix the value for compensation, and the project should pay the owner. It should also give displacement allowance or reinstate damaged properties to original condition such as school, health post and irrigation canals,
- technical committee should be established to assess the damage caused by vibration for compensation, and
- loss of crops, trees and other natural resources should be compensated, and in case of damage.

**ii) Reinstatement of Public Infrastructure and Services**

- community assets such as temples, bridges and irrigation canals, electricity poles, telephone lines, drinking water pipes, sewerage lines, roads, trails, cremation sites etc, should be compensated and reinstated by the contractor.

**iii) The Crime, Community Disturbance and Culture**

- workers should be prohibited visiting nearby village after 7 pm and against settling outside of their camp, gambling and alcohol abuse,
- workforce should be instructed to respect local culture, tradition, rights etc.,

- police should be requested to patrol in the camp site and adjoining villages, and
- awareness programs concerning the human trafficking and possibility of spread of STDs and HIV/AIDS should be launched.

**iv) Health and Hygiene**

- health check-up facilities, provision to control epidemic outbreak, sanitation and hygiene should be provided to the workforce,
- knowledge on STD, HIV/AIDS should be provided to the work force,
- warning system should be provided in the construction site. Regular liaison with community, placement of signboard, hoarding post, prohibition of visiting risky area, availability of first aid kits, ambulance facilities, fire fighting gears and information on healthcare services should be provided,
- protection and safety gears to all construction workers should be provided, and
- compensation should be provided for the loss of life or for any type of injuries.

**v) Loss of Archeological and Cultural Site**

- Archeological and cultural sites should be protected, and
- In case of relocation of such sites, local community should be consulted and their consensus should be achieved

**vi) Traffic Congestion**

- working hour should be scheduled at night, for Kathmandu Valley, and
- information about construction schedule should be provided to the local people.

**vii) Demolition**

- Upon completion of the project all unnecessary structures should be removed and facilities and other structures should be reinstalled to original condition.

## **2.4 Mitigation Measures during Operation Phase**

**i) Downstream Pollution due to Wastewater**

- Waste water should be adequately treated before releasing to natural surface water source. The treated waste water should comply with National Generic Standard for Wastewater to be discharged into Inland Surface Waters as given in Annex 2 of this document.

**ii) Waste problems due to sludge**

- Sludge should be disposed only at the designated area.

**iii) Safety of Drinking water**

- Water should be properly treated and distributed through safe and leakage free distribution system. Water at distribution system should comply with National Drinking Water Quality Standard given in Annex 4 of this document.

**Summary of mitigation measures is shown in Annex 1.**

## **3.0 DESCRIPTION OF PLANNED ENVIRONMENTAL MONITORING PROGRAM AND PARAMETERS**

**Monitoring Parameters and Frequency**

The types of impact as predicted, monitoring parameters, monitoring indicators, location and sources, responsibility and frequencies of monitoring have been described in Table 1. The monitoring protocols given below are based on the Environmental Impact Assessment Report and Environmental Management Plan (EMP, NIPPON KOEI CO, 2000 and 2001) approved by Government of Nepal and ADB.

Table 1: Monitoring Plan<sup>1</sup> of EMP Implementation

Impacts / Project Activities	Monitoring Plan for Implementation					
	Environmental Impact	Parameter to be monitored	Indicators	Location	Sources	Responsibility
<b>Design Phase</b>						
<b>1. Soil erosion sedimentation and slope instability</b>	- Incorporation of adequate drainage systems in design	Drainage system drawings	Design document, Technical specification	Bid document	Design Engineer	Once
	- Measures to stabilize unstable areas	Measures in the project design	Design document, Technical specification	Bid document	„	Once
	- Provision for proper disposal of excess materials	Incorporation in project design	Design document, Technical specification	Bid document	„	Once
	- Provisions to use safe quarry sites	Safe quarry site incorporated in design	Design document, Technical specification	Bid document	„	Once
	- Incorporation of drainage plan for WSDN	Drainage plan in the final design	Design document, Technical specification	Bid document	„	Once
<b>2. Vegetation clearance</b>	- Provision for minimal clearance of vegetation	Minimal vegetation clearance in the design	Design document, Technical specification	Bid document	„	Once
<b>3. Design for sludge disposal</b>	- Provision for appropriate design for sludge management	Provision for appropriate mechanism to for sludge management incorporated in final design	Design document, Technical specification	Bid document	„	Once
<b>Pre-Construction Activities</b>						
<b>1. Delineating of Project area</b>	- Records of loss of private properties	Maintained Records of loss of private properties	All the project sites	Project Records/KUKL	KVWSMB/KUKL	Once
<b>2. Acquisition Compensation Resettlement</b>	- Number of SPAF and PAF - Compensation payment - Resettlement and rehabilitation -based on RAP	List of SPAF and PAF Compensation records Resettlement carried out if any	All the project sites	Project Records KUKL	KVWSMB/KUKL	Once
<b>3. Approval of EMEP prepared by contractor</b>	- Incorporation of mitigation measures in EMEP as per EMP - Approval of construction drawings prepared by the contractor incorporating mitigation measures in design	Approved EMEP Construction drawings of EMEP	Project Office/Site Office	Contractor	KVWSMB/KUKL	Once
<b>4. Approval of temporary site</b>	- Details of acquisition needs - Approval from supervising engineer - Compensation based on RAP	Updated RAP Letter of Approval for temporary sites and relocation	Project Office/Site Office	KUKL	KVWSMB/KUKL	Once
<b>5. Permits and Approval</b>	- Letters of Approval, Permits and Agreements submitted to Supervising Consultant for the information /action	Issued Letters of Approval, Permits and Agreements Submitted such Letter of Approval, Permits and Agreement to Supervising	Project Office/Site Office	SE/Contractors	SE/Contractors	Once

<sup>1</sup> This table represents the monitoring activities as a part of overall EMP implementation

Impacts / Project Activities	Monitoring Plan for Implementation						
	Environmental Impact	Parameter to be monitored	Indicators	Location	Sources	Responsibility	Frequency
			Consultant				
<b>6. Pegging of project area</b>	<ul style="list-style-type: none"> <li>- Correct pegging according to design</li> <li>- records of vegetation and other properties maintained</li> </ul>	<ul style="list-style-type: none"> <li>site verification</li> <li>Office record and site verification</li> </ul>	Project site	Maps, documents and observations	Contractors and SE	Once	
<b>7. Workforce camps</b>	<ul style="list-style-type: none"> <li>- Ensure workforce camps are established within designed area</li> </ul>	<ul style="list-style-type: none"> <li>Established workforce camp at designated site</li> </ul>	Project site	Contractor report and observation	Contractors and SE	Once or more as required	
<b>8. Job opportunity</b>	<ul style="list-style-type: none"> <li>- Employment priority to local people with emphasis on SPAF, PAF</li> <li>- wage rate at par with DWEC</li> <li>- Ensure that minor (below age 14 are not employed)</li> </ul>	<ul style="list-style-type: none"> <li>Number of local people employed</li> <li>Paid wages at DWEC rate</li> <li>Minor (below age 14) not employed</li> </ul>	Project site	Employment records and observation	Contractor and SE	During construction every month	
<b>Construction Phase: Physical Environment</b>							
<b>1. Change in Hydrology and Morphology of streams and rivers</b>	<ul style="list-style-type: none"> <li>- Quarrying/Mining activity in river/streams for extraction of materials required for project</li> <li>- Existing irrigation canal/channel</li> <li>- Ensure care of stone spouts</li> </ul>	<ul style="list-style-type: none"> <li>River morphology</li> <li>condition of existing irrigation canal/cannel</li> <li>Flow in stone spout</li> </ul>	Kathmandu, Bhaktapur and Lalitpur	<ul style="list-style-type: none"> <li>Contractor's document and observation</li> <li>Hydrology data</li> <li>Monitoring data of water flow</li> </ul>	SE/ EMP CONSULTANTS	<ul style="list-style-type: none"> <li>During construction every month</li> <li>Regularly after completion</li> </ul>	
<b>2. Soil erosion sedimentation and slope stabilization</b>	<ul style="list-style-type: none"> <li>- Cut and fill balance</li> <li>- drainages systems</li> <li>- Stockpiling of top soil for its re-use</li> <li>- bio-engineering measures</li> <li>- Management of excessive spoil materials</li> </ul>	<ul style="list-style-type: none"> <li>Cut and fill according to design</li> <li>Drainage discharges and outfalls condition</li> <li>Location and numbers of stock piles of top soil stockpiled for its reuse</li> <li>erosion and river turbidity</li> <li>Spoil materials disposed sites</li> </ul>	Project Site	<ul style="list-style-type: none"> <li>Design drawings</li> <li>Design drawings and observations</li> <li>Contractor's document and observation</li> <li>Contractor's document and field observation</li> <li>Contractor's document and field observation</li> </ul>	Contractor/SE/EMP CONSULTANTS	<ul style="list-style-type: none"> <li>During construction</li> <li>Daily/ Weekly</li> <li>Weekly</li> <li>Monthly</li> <li>Monthly</li> </ul>	
<b>3. Water pollution</b>	<ul style="list-style-type: none"> <li>- Water analysis during construction period</li> </ul>	<ul style="list-style-type: none"> <li>Measurement of water quality <sup>2</sup> and comparison with baseline water quality measured before commencement of construction activity</li> </ul>	Streams and rivers of project site	Water analysis	KUKL/Contractor/ SE/EMP CONSULTANTS	Once in a month	
	<ul style="list-style-type: none"> <li>- Water quality at the spout/source</li> </ul>	<ul style="list-style-type: none"> <li>Measurement of water quality <sup>3</sup> and comparison with baseline water quality measured before commencement of construction activity</li> </ul>	Project site	Water analysis	KUKL/Contractor/ SE/EMP CONSULTANTS	Once in a month	
	<ul style="list-style-type: none"> <li>- Water quality of liquid wastes and solid waste disposal</li> </ul>	<ul style="list-style-type: none"> <li>Solid waste disposal</li> <li>Water quality within National Generic</li> </ul>	Project site	Water analysis observation	KUKL/Contractor/ SE/EMP	Once in a month	

<sup>2</sup> Water quality in terms of Turbidity, DO, BOD, pH, Nitrate, Phosphate, Chloride and Total Coliform content etc.

<sup>3</sup> Water quality in terms of Turbidity, Suspended Solids, DO, pH, Nitrate, Phosphate, Chloride, Total hardness, Total Coliform and Fecal Coliform content etc.

Impacts / Project Activities	Monitoring Plan for Implementation						
	Environmental Impact	Parameter to be monitored	Indicators	Location	Sources	Responsibility	Frequency
			Standard for : Wastewater to be Discharged into Inland Surface Waters from Combined Wastewater Treatment Plant <sup>4</sup>			CONSULTANTS	
<b>4. Effect in Air Quality</b>	- Air quality analysis during construction	Measurement of TSP, PM <sub>10</sub> and comparison with baseline condition or National Ambient Air Quality Standards <sup>5</sup>	Project location	Air sample analysis and observation	KUKL/Contractor/SE/EMP CONSULTANTS	During construction/ every week	
	- Implementation of dust control procedures	Measurement of TSP, PM <sub>10</sub> and comparison with baseline condition or National Ambient Air Quality Standards	Project location	Air sample analysis and observation	KUKL/Contractor/SE/EMP CONSULTANTS	During Construction/ every day	
<b>5. Noise Level and vibration</b>	- Baseline noise level	Below 70 dBA <sup>6</sup>	Project Site	Noise meter	KUKL/Contractor/SE/EMP CONSULTANTS	Every week	
	- Adoption of noise level control measures as specified in section 2.1	Maintain noise level below 70 dBA	Project Site	Noise meter	KUKL/Contractor/SE/EMP CONSULTANTS	Every week	
	- Compensation for the damages caused by vibration if any	Community complaints	Project Site	Records	KVWSMB/KUKL/ Contractor /SE/ EMP CONSULTANTS	During Construction	
<b>6. Solid Waste Problem</b>	- Production and management of solid waste	All materials, toxic, non toxic, hazardous waste stored in safe place Waste collected, segregated and disposed at designated area	Project site	Observation and records	KUKL/Contractor/SE/EMP CONSULTANTS	During the construction period	
<b>Construction Phase: Biological Environment</b>							
<b>1. Vegetation Clearance</b>	- Cutting of only the specified and marked trees	Number and type of trees cut	Project Site	Project Records	Contractor/SE/EMP CONSULTANTS	During site clearance	
	- Use of timber and wood	Number of wooden houses, restaurants in the project site	Project Site	Project Records	Contractor/SE/EMP CONSULTANTS	Every three months	
	- The availability of LPG/kerosene	Amount of LPG/Kerosene made available	Project Site	Project Records	Contractor/SE/EMP CONSULTANTS	Every month	
	- Trade on NTFPs	Change in rate of NTFPs traded from project site	Project Site	Project Records	Contractor/SE/EMP CONSULTANTS	Every three months	
	- Plantation @ 5 tree saplings per cut tree	No of trees planted and grown	Project Site	Project Records	KVWSMB/KUKL/ Contractor/SE/EMP CONSULTANTS	Every three months	
	- Encroachment in community forests	Community complaints	Community Forests at Project Site	Project Records	KVWSMB/KUKL/ Contractor/SE/EMP CONSULTANTSs	Every month	
<b>Construction Phase: Socio-economy</b>							
<b>1. Land Intake and</b>	- Compensation and Rehabilitation measures specified in section 2.3	Compensation distribution verification of	Project Site	Records and interview	KVWSMB/KUKL /	2 times a year	

<sup>4</sup> Refer to Annex 2 to for National Generic Standard: Wastewater to be Discharged into Inland Surface Waters from Combined Wastewater Treatment Plant

<sup>5</sup> Refer to Annex 3 for National Ambient Air Quality Standards

<sup>6</sup> IFC Environmental, Health and Safety (EHS) Guideline

Impacts / Project Activities	Monitoring Plan for Implementation					
	Environmental Impact	Parameter to be monitored	Indicators	Location	Sources	Responsibility
<b>compensation to affected people</b>	implemented	records and site	Project Site	Records and interview	Contractor /SE/EMP CONSULTANTS	and as required
	– Employment of affected people	Employment data from project records				2 times a year
<b>2. Reinstatement of damaged infrastructures and services</b>	– Reinstatement of damaged infrastructures	status of damaged/reinstated infrastructures	Project Site	Observation, interviews and photographic evidences	KVWSMB/KUKL/ Contractor /SE/ EMP CONSULTANTS	Once a year
<b>3. Crime and community stress</b>	– Situation of social disharmony	Social tensions, crime incidents	Project Location	Records and Interview	KVWSMB/ KUKL/ Contractor /SE/ EMP CONSULTANTS	Once a month
	– Awareness program	Level of awareness				
<b>4 Health and hygiene</b>	– The use of safety equipments by workforce	Use of safety equipments	Project Site	Records and interview and observation	Contractor/SE/ KUKL/ KVWSMB/EMP CONSULTANTS	Every week during construction
	– The provision of treatments	Provision of medical facilities				
	– Awareness program	Awareness program launched				
	– Signal and post	Installation of safety signals and posts at required areas				
	– Compensation for health	Records of health and compensation				
<b>5. Archaeological and cultural sites</b>	– Protection of cultural sites	Condition of protection of cultural sites	Project site	Records observation	Contractor/SE/ KVWSMB/KUKL/EMP CONSULTANTS	Every month
	– Involvement of local people	Nos. and type of consultations with local				
<b>6. Demolition</b>	– Removal of temporary facilities	No temporary structure left	Project site	Records observation	Contractor/SE/ KVWSMB/KUKL/EMP CONSULTANTS	Once after completion of Project
	– Reinstall to original condition	Returned to original condition				
<b>7. Traffic Management</b>	– Working schedule at Kathmandu Valley	No disturbance to vehicle movement during busy hours	Project site	Records observation/interviews	Contractor/SE	Every month
	– information about construction schedule to the local people	information flow to local people				
<b>Operation Phase</b>						
<b>Sludge disposal</b>	– Sludge disposal in safe place	No haphazard disposal of sludge	Project sites	Records /observation Laboratory Analysis	KUKL/KVWSMB	Regularly during operation
<b>Quality of drinking water supplies</b>	– Quality of potable water supplied	Measurement of Drinking Water Quality and comparison with National Drinking Water Quality Standards <sup>7</sup>	Reservoirs, Distribution Network			
<b>Waste water release</b>	– Quality of treated waste water that will be released to River	Measurement of Water quality and comparison with National Generic Standard for : Wastewater to be Discharged into Inland Surface Waters from Combined Wastewater Treatment Plant	at the site and downstream of waste water release	Records /observation Laboratory Analysis	KUKL/KVWSMB	Regularly during operation

Source: Environmental Impact Assessment, Vol II: Environmental Management Plan, (NIPPON KOEI CO, LTD, 2000)

SE: Supervising Engineers

<sup>7</sup> Please refer to Annex 4 for National Drinking Water Quality Standards

#### **4.0 DESCRIPTION OF PLANNED PUBLIC CONSULTATION PROCESS**

Public consultations were held in the entire process of EIA study; public consultation is mandatory in EIA Scoping, in the process of conducting EIA, and during the disclosure of the draft EIA report to the local people. These processes have taken place and the results were documented. However, public consultation component as such has not been included in scope of work of EMP, but the involvement of the local people in EMP implementation have been recommended. Accordingly, in the process of EMP implementation, the following mechanism should be adopted to involve the local people in EMP activity;

- a) Public consultation and involvement should be given highest priority in the implementation of mitigation measures. Public consultation should take place and on the basis of decision of the consultation meeting, implementation of mitigation measures should be prioritized and should be carried out with the involvement of local people.
- b) Monitoring is one of the component of EMP. Monitoring of Physical, Biological and Socio-economic parameters of the Environment of the project site should be carried out. The outcomes of the monitoring activities should be maintained in Database Centre. The results of monitoring should also be disclosed in the form of demonstration, charts, figures, graphs, and samples, etc., to the local people, school students and other interested stakeholders.
- c) In the process of compliance monitoring of the project construction, local people and construction workers should be consulted.

#### **5.0 DESCRIPTION OF THE RESPONSIBILITIES AND AUTHORITIES FOR IMPLEMENTATION OF MITIGATION MEASURES AND PROJECT MONITORING REQUIREMENTS**

Several actors are to be involved in the implementation of an EMP. The role and responsibility as described in EMP at different stages of project implementation are:

##### **Ministry of Environment, Science and Technology (MOEST)**

###### *Pre-construction Phase*

- review EIA reports and approve all mitigation measures as compliance condition, and
- review the monthly report of monitoring.

###### *Construction Phase*

- review monitoring report to examine: (i) whether or not all recommended measures are implemented, (ii) effectiveness of these measures, (iii) implementation of compliances, and (iv) employment of an independent monitoring group once a year.

###### *Operation Phase*

- project auditing after two years of operation.

## **Donor Agencies**

- review EIA Reports,
- review final project design and tender document,
- instruct EIA implementation from donors point of view at the construction stages, and
- review environmental monitoring report to: (i) examine whether all mitigation measures are implemented (ii) effectiveness of these measures (iii) compliance condition and environmental covenants and (iv) conduct independent auditing.

## **Ministry of Physical Planning and Works (MPPW)**

### *Pre-construction Phase*

- review EIA documents/submit to MOEST/get an approval and submit to donors,
- review design and tender document in order to examine whether or not mitigation prescriptions are included, and instruct KUKL.

### *Construction Phase*

- review EMP Report (i) to ensure EMP implementation (ii) effectiveness of the implementation measures (iii) compliance, and (iv) monitoring of construction twice a year.

### *Operation Phase*

- review bi-annual monitoring report, and
- annual site inspection.

## **KVWSMB/KUKL**

### *Pre-construction Phase*

- appoint PMU,
- review final design and tender document and forward them to MPPW,
- instruct PMU to update RAP and get it approved,
- establish 'Safeguard Unit/inter-agency coordination/appoint managers supervising engineer within PMU
- obtain all necessary permission, notify, carryout land acquisition, and
- select contractor, award and review EMP documents, prepared by the contractor and approve it.

### *Construction Phase*

- conduct frontline monitoring on (i) mitigation implementation (ii) effectiveness (iii) enhancement program (iv) appoint monitoring team (v) ensure public participation (vi) RAP implementation (vii) environmental compliance and (viii) prepare quality monitoring report to submit to MPPW/MOEST.

### *Operation Phase*

- ensure smooth operation of water supply system

## **EMP Consultants**

### *Pre-construction Phase*

- Baseline monitoring of air, water quality, noise level and overall environmental status of project area

### *Construction Phase*

- EMP compliance monitoring for construction activities (second order monitoring only),
- periodic monitoring of air quality, water quality and noise level at project area,
- monitoring of impacts on physical, biological and socio-economic components of environment of the project area,
- conducting Training and Community Awareness and periodic meeting with stakeholders, and
- submit monthly and biannual progress reports including monitoring results and mitigation activities.

## **Supervising Engineers**

### *Pre-construction*

- incorporate all provisions of EMP in final design,
- incorporate all mitigation measures to tender documents, and
- assist in site inspection during land intake.

### *Construction Phase*

- approval of construction works,
- frontline monitoring of the contractor's performance on EMP implementation/mitigation effectiveness/impact monitoring,
- employment as per EIA,
- instruct contractor for corrective actions,
- impose fine/or null payment in case of non-compliance, and
- prepare monthly monitoring report/participate in inspection.

## **Construction Contractor**

### *Pre Construction Phase*

- prepare EMEP for contracted components,
- select temporary land use site, and
- assist the supervising engineer for joint site inspection of KVWSMB/KUKL for approval.

### *Construction Phase*

- get the permission to start the work from the Supervising Engineer (SE),
- ensure that all prescriptions of EMP are included in work activities,

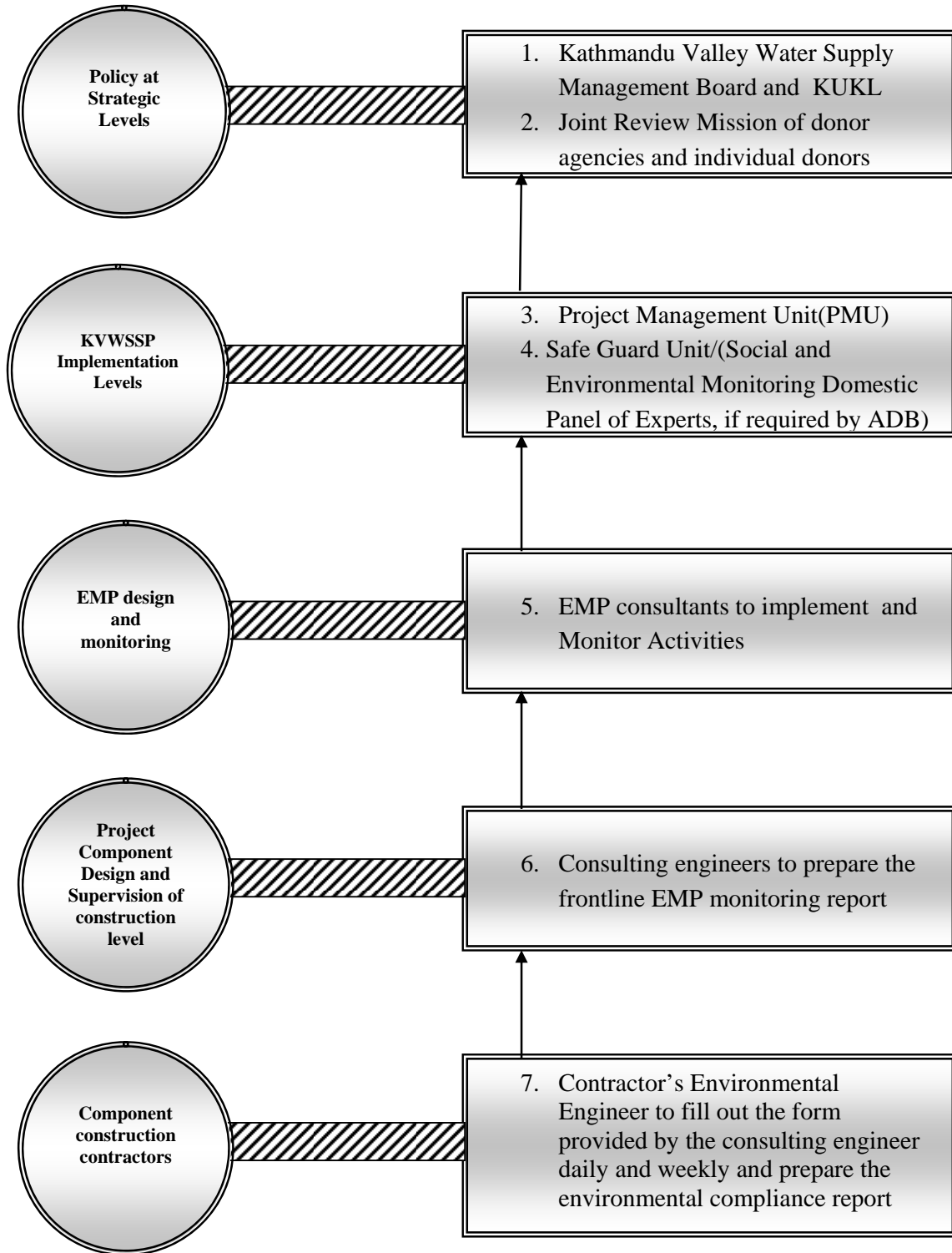
- ensure employment opportunity for the locals and maintain the records of employment, and submit to Supervising Engineer (SE),
- carry out corrective measures as recommended by SE,
- participate in monitoring and inspection,
- prepare an operational manual to submit to SE,
- provide training to the monitoring personnel, and
- submit monthly reports on EMP compliance to SE.

The environmental monitoring of Kathmandu Valley Water Supply and Sanitation Project includes field supervision and reporting of project activities prior and during the project construction and operation in order to ensure that the works are being carried out in accordance to the approved design and the environmental mitigation measures are fully implemented in accordance with EMP. To help timely identification of the actions needed for correction, a tiered system of monitoring (Figure 1) has been proposed involving i) front line monitoring ii) monitoring by the government line agencies or independent monitors and iii) auditing through the involvement of government agencies, donor agencies and independent auditors. The following are the comprehensive, systematic and tiered monitoring mechanism proposed to be implemented.

- Kathmandu Valley Water Supply Management Board (KVWSMB) and Kathmandu Upatyaka Khanepani Limited (KUKL) have been established. Safeguard unit of the project should report the output of the Environmental Monitoring of the project implementation to KVWSMB and KUKL through the Project Management Unit (PMU).
- Monthly progress reports on EMP implementation status should be submitted to concerned funding agencies and the joint review mission,
- 'Safeguard Unit' to be headed by a Senior Engineer should oversee the Environmental Monitoring activities undertaken by the EMP Consultants,
- Project Management Unit (PMU) should be routinely informed on the status of EMP implementation,
- At the project level, EMP consultants should carry out monitoring of the EMP components and parameters as specified in the EIA (2000); analyze the frontline monitoring report submitted by the consulting engineer and produce a second order monitoring report, which should be included in the monthly progress report,
- The consulting engineer should prepare a monthly frontline EMP monitoring report and should submit to the KVWSMB and KUKL, and
- Construction contractor is responsible to implement approved Environmental Mitigation Execution Plan; contractors prepare a monthly progress report and submit it to the KVWSMB and KUKL through the consulting engineer.

Responsibilities for undertaking specific mitigation measures and monitoring plans are specified in Annex 1 and Table 1 respectively.

**Fig 1: Proposed tiered monitoring system for Kathmandu Valley Water Supply and Sanitation Project (KVVSSP)**



Source: EMP Consultants, 2009

## 6.0 DESCRIPTION OF RESPONSIBILITIES FOR REPORTING AND REVIEW

As proposed by approved EMP (2001), the reporting system should include site supervision and reporting and primarily connected with Monitoring plan. The responsible agencies for implementation EMP and reporting has been presented in sections 3 and 5 of this report. However in brief, the construction contractor should develop Environmental Mitigation Execution Plan (EMEP) based on EMP. The EMEP should be approved by KVWSMB/ KUKL and the Supervising Engineer. The construction contractors are responsible for implementing approved EMEP. The Supervising Engineers are responsible for monitoring to oversee whether or not the contractors have complied with the approved conditions as stated in EMEP and also receive monthly progress report from construction contractors. Based on this information, the Supervising Engineers should prepare the front line monitoring report and submit to KVWSMB/ KUKL for review. KVWSMB/ KUKL should forward the frontline monitoring report to EMP Consultants for review and for developing a second order monitoring report. The second order monitoring report is developed based on field inspection, investigation, consultation and information given in frontline monitoring report. The second order monitoring report is included in monthly EMP implementation progress report and 20 copies of reports should be submitted to MWSDDB every month, which should be distributed to responsible agencies (Chapter 5) for review. EMP consultants should receive comments and suggestions from various authorities who receive the EMP progress report via KVWSMB/ KUKL.

## 7.0 WORK PLAN

The work plans of EMP implementation should include the following. All EMP programs listed below are based on the approved EMP of 2001.

- (i) monitoring program on physical, biological and socio-economic parameters of the environment of the project area as per EMP requirements;
- (ii) second order compliance monitoring of rehabilitation of existing water supply pipelines and development of new water supply networks;
- (iii) implementation of mitigation measures particularly on the improvement of local environment; and
- (iv) other basic studies as specified in the Scope of the Works (SOW)

Environment Management Office (EMO) within the Project Management Unit (PMU) should be established and should be designated as 'Safe Guard Unit'. The Safe Guard Unit should be headed by a Senior Engineer with adequate support staff and equipment. Approved EMP of 2001 for MWSP has made provision for staff allowances, operation cost, Computer, printer/photocopy furniture and contingencies under the heading of institutional strengthening and capacity building. A separate arrangement for budget has been proposed for the involvement of Ministries of Environment, Science and Technology and Physical Planning and

Works in the EMP programs. The following EMP programs are required to be implemented as per the approved EIA Report, relevant laws of Government of Nepal, and ADB's Environmental Specific Covenants and should be included in the contract documents of EMP consulting services.

### **7.1. General Activity**

#### *Progress Report on the Implementation of EMP (monthly, bi-annual reports)*

As required, monthly progress reports including bi-annual and annual reports on implementation of EMP should be produced on a regular basis. The monthly progress report should contain information on the works carried out and the results of all monitoring and investigation works performed during that particular month. The report should also include the cases of compliance and non-compliance and corresponding mitigation measures to be adopted to correct non-compliance cases and also include the outcomes of monitoring, the important issues identified and the measures to be undertaken to ameliorate them.

### **7.2. Physical EMP Activity**

#### **Monitoring**

##### *Second-order monitoring of EMP Compliance for Project Construction Activities*

The consultant engineers are responsible for conducting frontline EMP monitoring of construction activities; however, EMP Consultants are responsible for monitoring of all activities based on the frontline EMP reports submitted by the consulting engineers. EMP consultants should make regular field observations, studies & examine the cases of non-compliance and submit the report to KVWSMB/ KUKL. As per the requirements, EMP consultants should also provide instructions to consulting engineers and contractors for the improvement and for incorporation of correction measures for non-compliance cases.

The JICA component of Water Treatment Plant at Manohara has been completed and is now at the operational stage. Environmental Monitoring Programs were carried out following the JICA Environmental Guidelines and requires no more monitoring at the moment.

*Monitoring of Air Quality and Noise Level for Kathmandu Valley Water Supply and Sanitation Project (KVVSSP).* Monitoring of Air quality and Noise level should be conducted during the rehabilitation of water supply pipes and new construction of water supply systems and should be documented in monthly EMP progress report.

##### *Water Quality Analysis of the Bagmati and Manohara Rivers at different Locations*

The project construction activities add to the pollution of the rivers, springs, stagnant water bodies and drinking water supply at different locations. Water quality at different locations of Bagmati and Manohara Rivers should be analyzed in order to examine physical, chemical and biological quality of sample water collected on monthly and weekly basis and should be documented in monthly EMP progress reports.

### *Monitoring of the springs, Spouts and other Sources of Water in Kathmandu Valley*

Kathmandu Valley has several, water spouts, springs and wells at various places. Some of them have been already dried because of the severe encroachment and some of them are still functioning and serving to the local people as sources of water. During rehabilitation and installation of new pipelines, the existing spouts and other water sources may be disturbed or destroyed. In order to examine the continuity of the flow of the spouts and springs of Kathmandu Valley during the dry season, monitoring program should be launched, and such information should be included in monthly progress report.

## **7.3. Construction Related Mitigation Activities**

### **Monitoring**

The activities required for the mitigations of physical impacts shall be included in the cost estimate of EMP but their implementation shall be included in the contract for construction /improvement of Distribution Network, and Waste Water System. The EMP consultant shall nevertheless be responsible for the second order monitoring of the implementation of these activities.

### *Reinstatements of Damaged Infrastructures and Services at the Project Area*

During the implementation of rehabilitation of existing water supply pipelines and development of new water supply networks within Kathmandu Valley, several existing infrastructures and services will be damaged. The likely disrupted infrastructures and services include; irrigation canal, water supply system, trails and cremation sites. Such damages should be mitigated through the process of reinstatement.

### *Slope stability works at the construction sites*

Erosion control and slope stability through the installment of civil structures and Bioengineering are important and should be implemented in order to achieve the stability of slopes.

### *Off-Site Gully Control and Drainage Management Works*

Construction of slab culverts, bridge protection, bank protection and road edge protection works should be carried out at various places. Damaged drainages and out falls structures should be reinstated along the construction and rehabilitation sites.

### *Spoil-Tip Protection and Management Works:*

Laying of new water supply pipelines and rehabilitation & improvement of existing water supply pipelines are likely to generate huge quantity of excess materials. Some part of these will be used for filling the trench back and some amount will be requiring to dispose in designated disposal area. Such spoil tips should be properly managed through compaction, drainages, application of top soil on the surface and the plantation for the protection.

## **7.4. EMP Activities related to Biodiversity**

### **Monitoring**

*Stock taking of Vegetation species (Biodiversity Program)*

The rehabilitation and improvement of water supply pipelines will take place in the urban areas of Kathmandu, Bhaktapur and Lalitpur and the disturbances on vegetation is less likely. However, patches of urban vegetation are still existing at places; therefore, stock taking of vegetation species existing along the alignment of pipelines should be conducted. Information on the types of vegetation species, numbers, and other characteristics of the flora should be recorded.

**7.5. Mitigation Activities (Biological Aspects)****Monitoring***Replenishing Measures for the Vegetation Loss*

As per the rules and EIA requirements, plantation of tree saplings should be carried out at appropriate location in order to compensate the loss of trees that has occurred during rehabilitation and improvement of water supply pipelines. As mentioned in EIA (2000), the tree plantation should be carried out at the rate of 5 tree saplings for each cut tree. The implementation of these activities shall be carried out through the construction contracts for the DNI and WWS.

**7.6. EMP activities related to Social, Economic and Cultural Environment****Monitoring***Monitoring of the Impacts on Social and Cultural Aspects, and Health and Safety of Workers and Hygienic Condition of Workforce Camps*

Routine works of monitoring of the social, cultural, health and safety and sanitation condition of workforce should be conducted during the construction, rehabilitation and improvement of water supply pipelines as compliance monitoring of the activities.

**7.7. Awareness Activities (Social Aspects)***Community Awareness and Compensation for Local People*

While rehabilitating, improving the existing water supply pipelines and construction of new water supply pipelines, disturbances on the existing facilities of the local people may take place. The local people should be made aware of such disturbances through the dissemination of information, holding meetings with the local people, and requesting them to participate in the activities. In the events of property loss of the local people, the project should pay appropriate compensation as determined by 'Compensation Fixing Committee'.





## 7.8 Project Staff

The following are the experts and support staff to be involved in EMP implementation program. Subject matter specialists should also be involved in the program; their involvement will be intermittent only. The staffs and experts should be based in the field office.

**Table 3: List of EMP Field Staff**

S.N.	Designation	Duration of Involvement
1.	Team Leader and Environmental Specialist	Full time
2	Forest Specialist	Part time
3	Fishery Specialist	Part time
4	Sociologist	Part time
6	Water Pollution Specialist Environmental Management Specialist	Full time
7	Environmental Engineer	Part time
8	Civil Engineer	Full time
9	Computer Operator/Secretary	Full time
10	Field Assistant 3	Fulltime
11	Field Driver	Full time
12	Accountant cum Office Administrator	Full time
13	Office Attendant 2	Full time

## 8.0 PROCUREMENT PLAN

For purchasing items of small amount or paying the charges for Water Analysis, direct purchase negotiation or single tender dealing with particular suppliers or a limited number of Suppliers should be adopted as per the "Guidelines for Procurement under Asian Development Bank Loans" November, 2004. No ADB restricted items should be purchased.

## 9.0 DETAILED COST ESTIMATES

The cost for EMP activity implementation has been estimated based on "Major Changes in Scope and Implementation Arrangement; Melamchi water Supply Project and Kathmandu Valley Water Service Sector Development Program: Loan Number 1820, 2058, and 2059, January 2008 ADB. The detailed breakdown of the proposed budget has been made both for consultancy services and program implementation and is given in the following table:

**Table 4: Budget for EMP Implementation: Consultancy and EMP Activity Cost (Period: January 2009 to December 2013)**

SN	Budget Items	Estimated Amount for Consultancy Services (NRs.) <sup>8</sup>	Remarks
<b>1</b>	<b>EMP Consultancy Services</b>		
1.1	Personnel		
1.2	Remuneration	20,892,383	
1.3	Out of Pocket expenses		
1.4	Transport	800,000	
1.5	Monthly Progress, annual and bi-annual reports	360,000	
1.6	Communication	200,000	
1.7	Domestic Travel	40,000	
1.8	Other items office furniture and office running	600,000	
	Sub-Total	22,892,383	
	Contingency @10%	2,289,238	
	<b>Sub-Total</b>	<b>25,181,621</b>	
	VAT @13%	3,273,611	
	<b>Total amount</b>	<b>28,455,232</b>	
<b>2</b>	<b>EMP Activities</b>		
2.1.	Second order monitoring of EMP compliances		For this program the cost should be included in the EMP consultants contract amount.
2.2	Monitoring of air quality and noise level in the project area	400,000	Measurement of air quality may be implemented through the Construction Contract for DNI/WWS Improvement works.
2.3	Water Sample analysis of Bagmati and Manohara Rivers	1,200,000	Measurement of water quality may be implemented through the Construction Contract for DNI/WWS Improvement works.
2.4	Construction related mitigation measures <sup>9</sup>		Though the costs are included in the EMP estimates, the implementation shall be done through the relevant construction contract for DNI works,

<sup>8</sup> The consultancy cost has been calculated based on EMP contract, 2005 updated in 2008 and the number of staffs to be involved as proposed in table 3 for the duration of 2009-2013. The cost for the proposed EMP program activities has also been estimated based on the experiences of implementation of EMP of sub-project 1.

<sup>9</sup> These activities should be included in the construction contract but the monitoring shall be done by EMP consultants

SN	Budget Items	Estimated Amount for Consultancy Services (NRs.) <sup>8</sup>	Remarks
			and waste water system improvement works
2.4.1	Reinstatement of damaged infrastructure	10,000,000	
2.4.2	Slope stability works	4,000,000	
2.4.3	Off-site gully control and drainage management works	2,000,000	
2.4.4	Spoil tip protection and management works	2,800,000	
	<b>Sub-Total</b>	<b>20,400,000</b>	
2.5	Biological-EMP activity Monitoring		
2.5.1	Stock taking of vegetation species (Biodiversity Program)	100,000	The cost should be included in the EMP consultants contract amount.
2.5.2	Replenishing measures for vegetation loss - plantation	200,000	May be implemented through the Construction Contract for DNI/WWS Improvement works.
2.5.3	Support to community forests	50,000	The cost should be included in the EMP consultants contract amount.
	<b>Sub-Total</b>	<b>350,000</b>	
2.6	Social-Cultural-EMP activity		The cost should be included in the EMP consultants contract amount.
2.6.1	Monitoring of impacts on social and cultural aspects, health and safety measures, and condition of the workforce camps		
2.6.2	Monitoring of employment opportunity for locals		
2.6.3	Monitoring of the influx of the outside workers		
2.6.5	Awareness raising programs for locals	500,000	
	<b>Total Activity Cost</b>	<b>21,250,000</b>	
	<b>Total of consultancy and activity cost</b>	<b>49,705,232</b>	

Based on ADB: Major Changes in Scope and Implementation arrangements: Project Number, 31624 and 36609; Loan Number: 120, 2058, and 2059; January 2008 Nepal; Melamchi Water Supply Project and Kathmandu Valley Water Service Sector Development Program. The above budget allocations have been made based on the revised cost estimates by expenditure category; Appendix 7 Table, A 7.1

## 10.0 MECHANISMS FOR FEEDBACK AND ADJUSTMENT

EMP implementation is a multi-disciplinary task, the involvements of expertise of different sectors are imperative. Involvement of a Team Leader should be full time for the entire period of contract, while the involvements of other experts should be intermittent on as when needed basis. Involvement of some Field Assistants should be regular for the period of the project. Involvement of a civil engineer in the program is very critical. Some minor adjustments in man-months of the project staff should be made through PMU; however in case of major adjustment of EMP staff as required by the program should be made through PMU of KVWSMB/KUKL in consultation with ADB.

The feed back mechanism of the reporting should be conducted as under the tiered monitoring system as described in Fig.1 of Section 5. Depending upon the results of monitoring, necessary adjustments will be made to overall implementation of the EMP.

**Annex 1: Summary of the Mitigation Measures**

Project stage	Project Activity	Potential Environmental Impacts	Proposed mitigation measures	Institutional Responsibility	Cost
<b>Pre-Project Activity (Project Design)</b>	Identification of erosion Prone area	1. Soil erosion sedimentation and slope instability	Incorporate adequate drainage system in final design Incorporate in design suitable measures for handling excessive spoil materials Incorporation of drainage plan in final design Incorporation of measures to stabilize unstable areas in final design	Design Engineer.  Design Engineer  Design Engineer	Not available
	Incorporation of critical areas in project design				
	Design specification requiring less vegetation clearance	2. Vegetation loss	Develop design which requires less vegetation clearance	Design Engineer	
	Estimation of sludge volume and provision for their disposal	3. solid waste problem	Incorporation of sludge reduction measures in design	Design Engineer	
<b>Preparation for construction</b>	<b>Preparation of Project Site</b>				
	Pegging of the land area required by the project  Prepare RAP Disburse compensation and	1. Acquisition, compensation and resettlements	Delineate project land and prepare the list of project affected people  Prepare RAP Notify the people Provide compensation Implement RAP	KVWSMB/KUKL	Not available
	Approval of EMEP prepared by contractor	2. Inadequate attention may result Insufficient addressing of issues in EMEP	Ensure that all the mitigation measures and monitoring plan have been incorporated in EMEP	KVWSMB/KUKL	
	Identify the temporary areas required by the project and locate them with proper marking	3. May result social tensions	Prepare the details of temporary land acquisition and other private properties  Submit to Supervising Engineer Follow RAP for temporary acquisition	KVWSMB/KUKL SE/Contractor	
	Submit applications to get an approval  Submit such agreement and permits to Supervising Engineers for official information	4. May result social conflict and legal obstructions resulting in delay of work	Obtain Letters of Approval and Agreement for (i) temporary acquisition of land and properties (ii) relocation of religious site, foot trails, (iii) disruption of water supply, and others	Contractors/SE	
	Delineate and peg the areas required	5. May result social conflict and legal obstructions resulting in delay of work Pegging of project area	Pegging of all constructions site and labor camp  Maintain records of trees and other properties likely to be affected	Contractors/SE	
	Construct workforce camp	6. Haphazard camps resulting in social stress and degradation of local environment	Establish workforce camp at designated site only	Contractors/SE	-
	Make employment policy for local and affected people as per EMP	7. Local people may be deprived of opportunities, Minors may be employed	Employ local people (not under age 14) especially SPAF, and PAF in jobs  Settle wage rate based on DWEC and provide the list of employees to Supervising Engineer	Contractors/ SE	
<b>Construction</b>	<b>Construction Activity</b>				

Project stage	Project Activity	Potential Environmental Impacts	Proposed mitigation measures	Institutional Responsibility	Cost
Phase: Physical Environment	Adopt cut and fill principle during earthworks Disposal of excess materials in designated area Apply Bio-engineering for controlling of erosion and Gully	1. Soil Erosion sedimentation and slope instability	Adopt 'cut and fill' approach, wherever possible Avoid works during monsoon provide proper drainage facilities Stockpile top soil for reuse Adopt gully control and bioengineering Procure aggregates from already existing sites Dispose spoil in designated area	Contractors/SE	As per table 4; SN 2.4: 2.4.1, 2.4.2, 2.4.3, 2.4.4
	Quarrying from river bed	2. Change in River Hydrology and River Morphology	Avoid Quarrying/Mining activity in river/streams for extraction of materials required for project shall not be done so that change the river cross sections and longitudinal profile do not occur  Ensure care so that irrigation canal/channel are not adversely affected by the project construction  Ensure care of stone spout in order not to disturb the existing flow.	Contractors/SE	Not available
	Disturbance of drainage  Dumping of waste in the river  Construct of toilets in the camps  Storing of materials in the project area  Handling of toxic materials  Dumping of excess materials  Quarry operation	3. Water Pollution	Avoid camping facility within drainage  Prohibition on dumping of wastes in the water source  Provision of sanitary facility and prohibition on defecation in open areas  Proper storage of construction aggregates, hazardous, and toxic materials and proper disposal of chemical containers, packaging materials, plastic bags  provide training to workforce on safe handling of toxic materials  Disposal of waste in the designated area  provide dumping site and waste treatment facility  Avoid excessive mining from riverbed.	Contractors/SE	Cost not specified
	Movement of vehicles  Operation of crusher  Earthworks  Stockpiling of construction waste and construction materials	4. Air Quality deterioration	Spraying of water in dry season at construction site and disposal site (Three time a day)  Limit speed of construction vehicle  Disposal of excess materials in safe place  Regularly maintain equipment and cover the stockpile	Contractors/SE	Cost not specified

Project stage	Project Activity	Potential Environmental Impacts	Proposed mitigation measures	Institutional Responsibility	Cost
			Compliance of vehicles with National Vehicle Mass Emission Standards, 2056 BS Arrange proper ventilation in confined working areas		
	Movement of vehicles Operation of crusher Operation of construction machineries and equipment Horn honking	5. Noise and vibration	Fit mufflers to control noise speed limit of construction vehicle Use light horn in vehicles Maintenance of equipment Prohibit the operation of crushing plant between 7 PM to 6 AM Compensate the damages caused by vibration	Contractors/SE KVWSMB/KUKL	Cost not specified
	Scrapping of top spoil	6. Effect on Soil quality	Stockpile reusable top soil properly in safe yard	Contractors/SE	Cost not specified
	Storage of fuel, lubricating oil, chemicals etc. Project activities producing wastes such as used tyres, lubricating oil, exhausted battery etc	7. Solid waste problems, health risk	Store all materials, toxic, non-toxic and hazardous materials in safe place (warehouse) Collect, segregate and dispose waste at designated area	Contractors/SE	Cost not specified
<b>Construction Phase: Biological Environment</b>	<b>Construction Activity</b>				
	vegetation clearance for construction of project structures	1. Vegetation clearance	Cut only marked trees	Contractors/SE	
	Fuel wood and NTFPs collection by workforce vegetation clearance for construction of project structures and compensation to them	2. Loss of vegetation species	Prohibit fuel wood and timber collection Prohibit illegal NTFPs collection and Trade Provide LPG/kerosene to workforce Stockpile the felled trees and take permission from concerned authority for its use Plant trees @ 5 times of each felled trees Compensate for affected trees from private and community forests	Contractors/SE/ KVWSMB/KUKL	Table:4 2.5: 2.5.2
<b>Construction Phase: Socio-Economic Environment</b>	<b>Construction Activity</b>				
	compensation and Rehabilitation as per RAP	1. Land Intake and compensation to affected people	Avoid involuntary displacement Compensation, Rehabilitation and employment opportunity to the affected people Provide all possible assistance to the displaced people until the displaced people are settled Provide disturbance and rehabilitation cost Protect traditional rights of locals Compensate for any loss of crops, trees and other natural resources	KVWSMB/KUKL/ Contractor /SE/	Cost not Available

Project stage	Project Activity	Potential Environmental Impacts	Proposed mitigation measures	Institutional Responsibility	Cost
			Establish technical committee to assess damage caused by vibration for compensation		
	Reinstatement of damaged community services and infrastructures	2. Reinstatement of community services and infrastructures	Compensate or reinstate community assets such as temples, bridges and irrigation canals, electricity poles, telephone lines, drinking water pipes, sewerage lines, roads, trails, cremation sites etc	KVWSMB/KUKL/ Contractor/SE	
	Influx of outside workforce, money and disharmony activity	3. Increase in crime and community stress	Instruct Workforce for not to indulge in Gambling and drinking alcohol Prohibit Visiting of workers to nearby village after 7 pm and living outside Instruct workforce to respect local culture, tradition, rights etc. Request police to patrol in the camp site and adjoining villages Launch awareness programs concerning the human trafficking and possibility of spread of STDs and HIV/AIDS	KVWSMB/KUKL/ Contractor	Cost not Available
	Project Activities relating to health and safety issues at work areas	4. Health and hygiene (unsafe working conditions, accidents, fire hazard, transmission of communicable disease)	Provide facilities of health check, proper sanitation and hygiene, health care, control of epidemic diseases to workforce Provide awareness on STD, HIV/AIDS Place adequate warning system, signboard, hoarding post and prohibit visiting risky area as necessary Make available first aid kits ambulance and fire fighting gears Make available protection gears to all construction workers and compensate for the loss of life or any type of injuries	Contractors/SE KVWSMB/KUKL	Cost not specified
	Dislocation of archaeological artifacts, if any	5. Loss of Archaeological and cultural sites	Protect archaeological and cultural sites In case of relocation, consult local community	Contractors/SE KVWSMB/KUKL	Cost not specified
	Traffic management at construction sites	6. Traffic Congestion	For Kathmandu Valley working hour at night Provide information about construction schedule to the local people	Contractors/SE KVWSMB/KUKL	Cost not specified
	Demolition of unnecessary structures	7. Decline in aesthetics and inconvenience to people	Remove all unnecessary structures and reinstall the facilities and others to the original condition	Contractors/SE KVWSMB/KUKL	Cost not available
<b>Operational Phase</b>	Release of treated waste water to river Sludge disposal Ensure adequate supply of potable water to all households of Kathmandu	– Downstream pollution – Waste problems due to sludge	Treat waste water adequately before releasing to natural surface water source Dispose sludge at designated area	KUKL/KVWSMB	Cost not available

Project stage	Project Activity	Potential Environmental Impacts	Proposed mitigation measures	Institutional Responsibility	Cost
	Valley	– Disposal of waste water	Disposal and treatment of waste water collected from households Proper treatment of drinking water and safe and leakage free distribution system		

Source: Environmental Impact Assessment, Vol II: Environmental Management Plan, (NIPPON KOEI CO, LTD, 2000)

**Annex 2**  
**Generic Standard**  
**Part III**

**Tolerance Limits for Wastewater to be Discharged into Inland Surface Waters from  
Combined Wastewater Treatment Plant**

Characteristics	Tolerance Limit
Total Suspended solids, mg/L, Max	50
Particle size of total suspended particles	Shall pass 850-micron Sieve.
pH	5.5 to 9.0
Temperature	Shall not exceed 40 degree C in any section of the stream within 15 meters down-stream from the effluent outlet.
Biochemical oxygen demand (BOD) for 5 days at 20 degree C, mg/L, Max	50
Oils and grease, mg/L, Max	10
Phenolic compounds, mg/L, Max	1
Cynides (as CN), mg/L, Max	0.2
Sulphides (as S), mg/L, Max	2
Radioactive materials:	
a. Alpha emitters, c/ml, Max	7-Oct
b. Beta emitters, c/ml, Max	8-Oct
Insecticides	Absent
Total residual chlorine, mg/L	1
Fluorides (as F), mg/L, Max	2
Arsenic (as As), mg/L, Max	0.2
Cadmium (as, Cd), mg/L, Max	2
Hexavalent chromium (as Cr), mg/L, Max	0.1
Copper (as Cu), mg/L, Max	3
Lead (as Pb), mg/L, Max	0.1
Mercury (as Hg), mg/L, Max	0.01
Nickel (as Ni), mg/L, Max	3
Selenium (as Se), mg/L, Max	0.05
Zinc (as Zn), mg/L, Max	5
Ammonical nitrogen, mg/L, Max	50
Chemical Oxygen Demand, mg/L, Max	250
Silver, mg/L, Max	0.1

## Annex 3

## National Ambient Air Quality Standards for Nepal

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum	Test Methods
TSP (Total Suspended Particulates)	$\mu\text{g}/\text{m}^3$	Annual	-	
		24-hours*	230	High Volume Sampling
PM <sub>10</sub>	$\mu\text{g}/\text{m}^3$	Annual	-	
		24-hours*	120	Low Volume Sampling
Sulphur Dioxide	$\mu\text{g}/\text{m}^3$	Annual	50	Diffusive sampling based on weekly averages
		24-hours**	70	To be determined before 2005.
Nitrogen Dioxide	$\mu\text{g}/\text{m}^3$	Annual	40	Diffusive sampling based on weekly averages
		24-hours**	80	To be determined before 2005.
Carbon Monoxide	$\mu\text{g}/\text{m}^3$	8 hours**	10,000	To be determined before 2005.
		15 minute	100,000	Indicative samplers ***
Lead	$\mu\text{g}/\text{m}^3$	Annual	0.5	Atomic Absorption Spectrometry, analysis of PM <sub>10</sub> samples****
		24-hours	-	
Benzene	$\mu\text{g}/\text{m}^3$	Annual	20	Diffusive sampling based on weekly averages
		24-hours	-	

**\*Note:** 24 hourly values shall be met 95% of the time in a year. 18 days per calendar year the standard may be exceeded but not on two consecutive days

**\*\*Note:** 24 hourly standards for NO<sub>2</sub> and SO<sub>2</sub> and 8 hours standard for CO are not to be controlled before MOPE has recommended appropriate test methodologies. This will be done before 2005

**\*\*\*Note:** Control by spot sampling at roadside locations: Minimum one sample per week taken over 15 minutes during peak traffic hours, i.e. in the period 8am - 10am or 3pm - 6pm on a workday. This test method will be re-evaluated by 2005

**\*\*\*\*Note:** If representativeness can be proven, yearly averages can be calculated from PM<sub>10</sub> samples from selected weekdays from each month of the year.

**Annex 4**  
**National Drinking Water Quality Standard 2062 B.S.**

Type	Parameter	Unit	Maximum Concentration Limits	Remarks
Physical	Turbidity	NTU	5 (10)	
	pH	-	6.5-8.5*	
	Color	TCU	5 (15)	
	Taste & Odor	-	Should not be objectionable	
	Total Dissolved Solids	Mg/L	1000	
	Electrical Conductivity	µs/cm	1500	
Chemical	Iron	Mg/L	0.3 (3)	
	Manganese	Mg/L	0.2	
	Arsenic	Mg/L	0.05	
	Cadmium	Mg/L	0.003	
	Chromium	Mg/L	0.05	
	Cyanide	Mg/L	0.07	
	Fluoride	Mg/L	0.5 - 1.5 *	
	Lead	Mg/L	0.01	
	Ammonia	Mg/L	1.5	
	Chloride	Mg/L	250	
	Sulphate	Mg/L	250	
	Nitrate	Mg/L	50	
	Copper	Mg/L	1	
	Calcium	Mg/L	200	
	Zinc		3	
	Mercury		0.001	
	Aluminum		0.2	
Residual Chlorine	Mg/L	0.1 - 0.2 *	Only for system using chlorine.	
Micro Biological	<i>E. coli</i>	MPN/100 ml	0	
	Total Coliform	MPN/100 ml	0 (95 % in Sample)	

\* These values suggest minimum & maximum limit.  
( ) The value inside bracket is valid if there is no alternative.