Draft Initial Environmental Examination

Project Number: 34304
February 2015

NEP: Kathmandu Valley Water Supply Improvement Project (Additional Financing)

Prepared by Department of Urban Development and Building Construction, Ministry of Urban Development, Government of Nepal for Asian Development Bank

CURRENCY EQUIVALENTS

(as of 02 February 2015)

Currency Unit	=	Nepalese rupee/s (NRe/NRs)
NRe1.00	=	$0.0101007
$1.00	=	NRs99.0025

ABBREVIATIONS

ADB	–	Asian Development Bank
BDS	–	Bulk Distribution System
CBP	–	Capacity Building and Public-Private Partnership Support
CIAMP	–	Capital Investment and Asset Management Program
CITES	–	Convention of International Trade in Endangered Species
DWEC	–	District Wage Evaluation Committee
DNI	–	Distribution Network Improvement
DSC	–	Design and Supervision Consultant
EARF	–	Environmental Assessment and Review Framework
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
ENPHO	–	Environmental and Public Health Organisation
EPR	–	Environment Protection Rules
HPCIDBC	–	High Powered Committee for Integrated Development for Bagmati Civilization
HWUSRUKV	–	Household Water Use Survey and Research in Urban Kathmandu Valley
LPG	–	Liquefied Petroleum gas
ICIMOD	–	International Centre for Integrated Mountain Development
IEE	–	Initial Environmental Examination
INGO	–	International Non-governmental Organization
JICA	–	Japanese International Cooperation Agency
KUKL	–	Kathmandu Upatyaka Khanepani Limited
KVTDC	–	Kathmandu Valley Town Development Committee
KVWSMB	–	Kathmandu Valley Water Supply Management Board
KVWSSDP	–	Kathmandu Valley Water Services Sector Development Program
LICSU	–	Low Income Consumer Support Unit
MPPW	–	Ministry of Planning and Physical Works
MOE	–	Ministry of Environment
MOEST	–	Ministry of Environment, Science and Technology
MUD	–	Ministry of Urban Development
MWSDB	–	Melamchi Water Supply Development Board
MWSP	–	Melamchi Water Supply Project
NEWAH	–	Nepal Water for Health
NGO	–	Nongovernment organization
NTFP	–	Non-timber Forest Product
NWSC	–	Nepal Water Supply Corporation
OHS	–	Occupational Health and Safety
PAF	–	Project Affected Family
PID	–	Project Implementation Directorate
PPE	–	Personal Protective Equipment
PPTA	–	Project Preparatory Technical Assistance
REA	–	Rapid Environmental Assessment

SPS	–	Safeguards Policy Statement
UDLE	–	Urban Development Through Local Efforts
UNEP	–	United Nations Environment Program
VDC	–	Village Development Committee
WSI	–	Wastewater System Improvement
WSS	–	Water Supply and Sanitation
WSTFC	–	Water Supply Tariff Fixation Commission
WUO	–	Water Utility Operator

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EXECUTIVE SUMMARY

1. ADB approved the Kathmandu Valley Water Supply Improvement Project (KVWSIP) on 16 September 2011[1] and the project became effective on 7 February 2012. The $130 million project complements past and on-going efforts to improve access, efficiency, and reliability of water supply services to the residents of the Kathmandu Valley. The objective is to improve water availability in 80% of the operator's service area. The project complements other ongoing ADB financed projects focusing on source augmentation and transmission as well as wastewater collection and treatment. While the on-going Melamchi Water Supply Project (MWSP – Loan 1820) is investing largely in source augmentation and construction of the Melamchi tunnel with expected completion by end 2016, and the on-going Kathmandu Valley Wastewater Management Project (KVWMP – Loan 3000) focuses on wastewater management, the KVWSIP (Loan 2776) focuses on distribution of water from the treatment plant to consumers, and improvement of efficiency and service delivery.[2]

2. The purpose of the proposed additional funding is to improve the water supply system service delivery, to ensure compliance of KUKL's operating license. The additional financing is required to (i) increase the coverage and benefits of the project and the related projects, (ii) further strengthen the governance and performance of the Kathmandu Valley water sector institutions, and (ii) meet a financing gap of the original project.[3]

3. The additional financing will (i) increase the number of beneficiaries with access to potable water and improved services in the Kathmandu Metropolitan Area and three additional municipalities in KUKL's service area through bulk distribution systems (BDS) and distribution network improvements (DNI); (ii) replace more of the existing, dilapidated network, with estimated average physical losses of more than 45%; (iii) double the current capacity of the Sundarijal water treatment plant to 170 million liters per day (MLD), the volume to be transported from the Melamchi River;[4] (iv) plan and prepare the pipeline of investments required to meet 2025 demand; and (v) strengthen the Kathmandu Valley water sector institutions.

4. The Ministry of Urban Development[5] will continue to be the executing agency and KUKL, through its existing Project Implementation Directorate (PID),[6] will continue to be the implementing agency for all works related to distribution network improvements and institutional strengthening. PID has a safeguards unit composed of senior environmental officer, legal officer and social development officers. Under the additional financing, a second implementing agency, the Melamchi Water Supply Development Board (MWSDB), will implement two packages: (i) Sundarijal water treatment plant expansion (works), and (ii) design consultancy for Yangri and Larke source augmentation. This arrangement is in line with the institutional framework of the Kathmandu Valley's water sector, which separates responsibilities for capital development of

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[1] ADB. 2011. *Report and Recommendations of the President to the Board of Directors: Proposed Loan to the Kingdom of Nepal for the Kathmandu Valley Water Supply Improvement Project.* Manila. The total project cost was $130 million equivalent, to be funded by the Government of Nepal ($50 million) and ADB ($80 million).

[2] In the parallel project, the Japan International Cooperation Agency is providing support for the development of a water treatment plant for 85 MLD from the Melamchi tunnel.

[3] The original loan was used to achieve readiness for the additional financing in design, preparation of bidding documents, safeguard requirements, and other due diligence.

[4] Phase 1 of the Sundarijal water treatment plant (85 MLD) is financed by JICA and completion is expected in 2016.

[5] The RRP of the current project (Loan 2776) indicates that the executing agency is the Ministry of Physical Planning and Works. Ministry of Urban Development was created after the approval of the current project.

[6] PID is staffed with sufficient number of experienced professionals including a Joint Secretary level Project Director. It has experience in implementing the original project and Subproject 2 of Loan 1820: Melamchi Water Supply Project for the last five years.

bulk water supply (source and treatment systems) from the distribution system. A project steering committee has been established and is chaired by the Secretary, Ministry of Urban Development. The municipalities to be covered through the additional financing will be represented on the committee. Consultants will support the MPPW and KUKL in project management, engineering design, construction supervision, procurement of goods and services, institutional development, capacity building, safeguards implementation and monitoring, community awareness and participation, etc. PID is currently being supported by a project management consultant (PMC) and a design and supervision consultant (DSC 3). DSC 3 will finalize the detailed designs for the DNI packages; and a new consultant (DSC 5) will be recruited to supervise all new works under the additional financing.

5. The Government of Nepal and ADB require that the environmental impacts of development projects be identified and assessed as part of the planning and design processes, and that action is taken to reduce those impacts to acceptable levels. ADB requirements for environmental assessment are described in its Safeguard Policy Statement (SPS, 2009).This is the draft Initial Environmental Examination (IEE) based on the feasibility study and preliminary engineering designs prepared during project preparation. This IEE will be finalized during detailed design stage to reflect any changes and latest subproject designs. The final IEE will be submitted to ADB for review and approval prior to the awarding of contracts.

6. **Categorization.** The project has been classified by ADB as environmental category B, indicating no significant impacts. The initial screening assessment of the project is described in the Rapid Environmental Assessment (REA) checklist in Appendix 1. An IEE is required by ADB to determine whether significant impacts warranting an environmental impact assessment (EIA) are likely. The IEE includes an environmental management plan (EMP) to ensure that impacts during the life of the project are monitored and managed. The EMP is to be included in bidding and contract documents. The civil works contractor should develop an Environmental Mitigation Execution Plan (EMEP) based on the EMP.

7. The Government of Nepal, according to EPR 1997, requires an EIA study for all projects supplying drinking water to a population of more than 100,000, and the connection of new sources.[7]

8. The IEE incorporates lessons learned from the pilot Distribution Network Improvement (DNI) works conducted under Loan 1820. These lessons are reflected in the EMP, and ensure that contractors, the executing agency, and design supervision consultants (DSC) have clear roles and responsibilities in environmental management during implementation.

9. **Description of the environment.** The project components are located in Kathmandu Valley urban area or in its immediate surroundings which were developed into urban land uses. The project sites are located in existing right of ways (RoW) and government-owned land. There are no protected areas, wetlands, mangroves, or estuaries in or near the project direct impact zones.

[7] An Environmental Impact Assessment (EIA) was prepared in 2000 for Loan 1820-NEP (SF): Melamchi Water Supply Project (MWSP), and was approved by the then Ministry of Environment and Population and ADB. The previously approved EIA included all the components under the proposed project. Therefore, the government confirmed that the original EIA prepared in 2000 was still valid for the proposed project and that all government rules are fully complied, requiring no additional or new EIA study. A copy of the official letter confirming the government's decision on the original EIA and compliance with their environmental rules for the proposed project is in Appendix 8. The ADB Fact Finding Mission also met with the Ministry of Environment and Ministry of Planning and Physical Works on 18 March 2011 to confirm the government's decision on this matter.

10. **Environmental management.** An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance were reduced through mitigation measures in the preliminary design stage. The EMP will form part of the civil work bidding and contract documents.

11. Locations and siting of the proposed infrastructures were considered to further reduce impacts. The concepts considered in design of the project are: (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people; (ii) taking all possible measures in design and selection of alignment to avoid resettlement impacts; (iii) avoiding where possible locations that will result in destruction/disturbance to historical and cultural places/values; (iv) avoiding tree-cutting where possible; and (v) ensuring all planning and design interventions and decisions are made in consultation with local communities and reflecting inputs from public consultation and disclosure for site selection.

12. During the construction phase, impacts mainly arise from (i) disturbance of residents, businesses, and traffic; (ii) need to manage excess construction materials and spoils; and (iii) community and workers health and safety. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during excavation works on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. During operations phase, the facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. The main impact is increased generation of wastewater. KVWMP will improve the existing wastewater collection and treatment systems by rehabilitating existing sewage treatment plants and expanding the sewerage network, as well as providing a septage treatment facility. All wastewater effluents must meet government treatment standards. Sludge disposal from the sewage treatment plant is addressed in KVWMP EMP.

13. Mitigation measures have been developed to reduce all negative impacts to acceptable levels and will be assured through a program of environmental monitoring. The monitoring program will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

14. All the costs related to cutting of trees shall be borne by the project itself. The new water supply pipeline to the reservoirs in the Nagarjun Park will follow the existing access road so as to avoid the cutting of trees. If, during the detailed design, it is found that tree cutting is unavoidable, it is mandatory to get permission for the Parks Department and Forest Department, plant 25 saplings for every tree cut, and maintain them for 5 years. The cost for the cutting and nurturing of one tree for 5 years has been estimated at $600. These costs are included under the government's counterpart budget contribution.

15. The project also includes additional precautions to be taken while laying pipes within roads through heritage areas, including permissions from the Department of Archaeology, and additional supervision by trained heritage professionals during construction. No heavy equipment will be used and no buildings impacted.

16. The PID will submit semi-annual monitoring reports to ADB which will include a detailed review of EMP implementation, including corrective actions taken.

17. **Consultation, disclosure and grievance redress.** ADB SPS and the Government of Nepal rules require meaningful stakeholder consultations. A national community awareness and participation consultant team has been hired under KVWSIP to facilitate programs during the project period. The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the bproject. PID also translated the IEE and made it available in their office and other public locations. A uniform grievance redress mechanism (GRM) has been established under KVWSIP to address any environmental and social complaints during project implementation.

18. **Monitoring and reporting.** The PID is responsible for safeguard monitoring and will send semi-annual monitoring reports to ADB. ADB will post the semi-annual environmental monitoring reports on its website as part of its disclosure requirements.

19. **Conclusion and main findings.** The project will result in a significant improvement in public health and quality of life for Kathmandu's citizens. Some negative impacts are anticipated during construction, but in specific areas and for short duration (dust, noise, traffic problems, access to buildings, etc.). It is expected that the adverse environmental impacts of the water supply project for the Kathmandu Valley will in general not be significant, and can be easily and inexpensively mitigated and prevented through adequate measures and regular monitoring during design, construction, and operation. Based on this IEE, no further EIA study is required.

I. INTRODUCTION

1. ADB approved the Kathmandu Valley Water Supply Improvement Project (KVWSIP) on 16 September 2011[1] and the project became effective on 7 February 2012. The $130 million project complements past and on-going efforts to improve access, efficiency, and reliability of water supply services to the residents of the Kathmandu Valley. The objective is to improve water availability in 80% of the operator's service area. The project complements other on-going ADB financed projects focusing on source augmentation and transmission as well as wastewater collection and treatment. While the on-going Melamchi Water Supply Project (MWSP – Loan 1820) is investing largely in source augmentation and construction of the Melamchi tunnel with expected completion by end 2016, and the on-going Kathmandu Valley Wastewater Management Project (KVWMP – Loan 3000) focuses on wastewater management, the KVWSIP (Loan 2776) focuses on distribution of water from the treatment plant to consumers, and improvement of efficiency and service delivery.[2]

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II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

6. The Safeguard Policy Statement (SPS, 2009) of ADB stipulates addressing environmental concerns, if any, of a proposed activity in the initial stages of project preparation. For this, ADB categorizes the proposed components into categories (A, B, or C) to determine the level of environmental assessment required to address the potential impacts. The project has been categorized as B. This IEE has been prepared to address the potential impacts, in line with the recommended IEE content and structure for category B projects. Stakeholder consultation was an integral part of the IEE. An EMP outlining the environmental measures to be adhered to during implementation of the project has also been prepared. The IEE forms part of the bidding and contract documents.

B. Government of Nepal Rules and Regulation

1. Environmental assessment procedures

7. The requirements for environmental assessment in Nepal were established by the National Environment Protection Act (EPA 1997), and the procedures are defined in the Environment Protection Rules (EPR 1997) and its amendment of 20 August 2007.

8. The Government of Nepal (according to EPR 1997) requires that all projects supplying drinking water to a population of more than 100,000 and the connection of new sources require an EIA. The proposed project (Kathmandu Valley Water Supply Improvement Project) is a de facto part of MWSP. It includes sections of the BDS and DNI works included in the original MWSP. Subproject 2 under the restructured Loan 1820 was subjected to EIA in 2000, and was approved by the then Ministry of Environment and Population of the Government of Nepal and ADB. Subproject 2 did not introduce any new infrastructure requiring a separate environmental examination, but was a scaled-down version of the BDS and DNI works included in the original MWSP. The environmental assessment, mitigation prescriptions, and monitoring plan given in the EIA Report of 2000 were still valid during the approved restructuring in 2008, and it was agreed by ADB and the government that undertaking a new EIA for subproject 2 was not necessary. The same applies to the current proposed project, as no new components or locations of facilities are being introduced. This was confirmed by the Ministry of Environment in March 2011, and the written confirmation is provided in Appendix 2. Thus EIA is not required for this project.

2. Environmental laws, rules and regulations

9. Any component included under the project shall comply with the Government of Nepal's environmental laws, standards, rules, and requirements. Key standards include those related to wastewater effluent quality, sanitation sector and protected areas. Compliance is required in all stages of the project, including design, construction, and operation and maintenance. Appendix 3 provides the list of environmental laws, rules and regulations.

10. Nepal is also a signatory to many international agreements and conventions related to environmental conservation, such as:

(i) Plant Protection Agreement for Asia and the Pacific Region, 1956;
(ii) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973);
(iii) Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention), 1972;
(iv) International Tropical Timber Agreement, 1983; and
(v) Convention on Biological Diversity, 1992.

The following are required permits and clearances to be obtained by the project prior to construction:

(i) tree-cutting clearance from Forest Department;
(ii) ring road construction permit from Roads Department and metropolis/sub-metropolis permit for inner roads;
(iii) permit from Parks Department for works along access road in Shivapuri Nagarjun National Park; and
(iv) permit from Department of Archaeology, especially in Patan and Darbar Squares.

III. DESCRIPTION OF THE PROJECT

A. Existing Conditions of Water Supply Infrastructure

11. The Kathmandu Valley water distribution network system is a very complex and ad- hoc water network system developed more than 100 years ago. The present area being served by the KUKL system in the Kathmandu Valley comprises the municipal areas of Kathmandu,

Lalitpur, Bhaktapur, Thimi, Kirtipur, and parts of adjoining village development committees (VDCs), primarily around Kathmandu, Lalitpur, and Bhaktapur.

12. The water distribution system has been installed and expanded at various times from the days of the Rana regime in the country over a hundred years ago, when the Bir Dhara and Tri Bhim Dhara systems were developed. Subsequently, the systems were upgraded and expanded in the 1960s with the assistance of the Indian Cooperation Mission (ICM). More of the development and expansion of the system, especially in Kathmandu and Lalitpur, took place when the World Bank provided assistance to a series of projects during the 1970s and the 1980s through the Water Supply and Sewerage Development Board. The Board was subsequently converted into a utility corporation, initially called the Water Supply and Sewerage Corporation, and later the Nepal Water Supply Corporation (NWSC). In February 2008, water sector assets in the Kathmandu Valley were transferred for operation to a government-owned company called the KUKL.

13. From the 1980s until now, a number of investments, with assistance from the World Bank, the Japanese International Cooperation Agency (JICA), and other donor agencies resulted in a more comprehensive water distribution system trying to provide services to the ever-growing population of the Kathmandu Valley. Apart from external support, internally generated resources have also been utilized to cater to the growing demand, often in a piecemeal manner.

14. At present, the water supply system has 30 surface sources and more than 50 operational tube wells located in different parts of the Valley. The sources feed into 21 water treatment plants with a combined treatment capacity of 85 MLD and 42 service reservoirs with a combined storage capacity of approximately 40,800 m^3. Water is distributed to about 2 million consumers through about 1,250 km of pipelines, 165,000 private connections, and 1,196 public stand posts. The system is being managed by 10 branch offices of KUKL, with 6 of them for the Kathmandu Metropolitan City area and adjoining VDCs, 1 for Lalitpur and adjoining VDCs, 1 for Bhaktapur and adjoining VDCs, 1 for Kirtipur and adjoining VDCs, and 1 for Madhyapur Thimi and adjoining VDCs.

15. Deep tube wells are the main means of extracting groundwater for use in the water supply system. Out of 73 existing deep tube wells, only 54 are in operation at present. Most of the tube wells' electromechanical parts are in a bad condition, with most flow meters missing or broken. The tube wells used to be operated only in the dry season in order to supplement reduced surface water sources, but with demand exceeding supply, they are now also used in the wet season. Total dry season rate of production is 40.6 MLD, with a reduced wet season production of 2.2 MLD. To avoid ground subsidence and over-exploitation, KVWSMB is undertaking a Groundwater Management and Regulation Policy Preparation Study (ADB SDP Loan 2059) that will establish processes to regulate and control or prohibit the extraction and use of groundwater within the Kathmandu Valley. The ADB Melamchi Project (Loan 1820) will replace or install flow and water depth instrumentation in all ground water tube wells for extraction monitoring.

16. The present population of the valley's water supply service area is estimated at 2.7 million, with a water demand of 195 MLD. The total water production in the wet and dry seasons is about 140 and 100 MLD, respectively. The resultant water supply is constrained and intermittent. People in most of the areas hardly get 1 hour's supply every fourth day.

17. There are many problems in the distribution system besides deficiency in water. These include aging pipes, high percentage of leakage and wastage, illegal and spaghetti connections, unscientifically laid pipelines, supply contamination, and many others. There are also problems with production. The ground water is depleting due to over-extraction, and surface water catchments are becoming degraded.

18. **Water quality**: The most recent water quality assessment carried out by the Environmental and Public Health Organization (ENPHO) in 2009 highlighted the nature and problems of water quality in surface and groundwater sources currently being used by KUKL. The most common and significant water quality problem in the existing surface water sources is bacteriological contamination, mainly the presence of *E. coli* bacteria in nearly all surface water sources. This is mainly due to increased human activity in and around the water sources. The proposed intake for the project is from an isolated mountain stream located in the high hills with limited human habitation in the surrounding area, and therefore should be able to avoid such contamination.

19. In the case of groundwater sources in the valley, ammonia and iron are the major problems. Of the 50 wells tested and in operation, nearly 27 wells had water with ammonia levels above the recommended level of 1.5 mg/l. The highest recorded value for ammonia was 109 mg/l, with several in the range of 80 mg/l. Wells in the Manohara well field had water with ammonia in the range of 4-15 mg/l. Tube wells under the Tripureshwor branch in Kuleshwor, Kalanki, Lagan, and Tahachal had water with ammonia above 50 mg/l. Similarly, iron has been encountered in the water in nearly all the wells, with 48 of the wells containing water with iron above the permissible limit of 0.3 mg/l. The water with the highest iron content was in the tube well in Koteshwor, with 24.32 mg/l, and there are a number of wells with iron concentration in their water in the range of 10 mg/l.

20. Water in a couple of wells also indicated the presence of arsenic. It has been strongly recommended that these wells be regularly tested and possibly abandoned as drinking water sources under KUKL's regular operational activities. ENPHO also tested the water samples for the presence of pesticides. Water from some of the wells in Bansbari and one in Jagati revealed the presence of pesticides like heptachlor and aldrin, which could be due to the use of pesticides in nearby agricultural fields.

B. Description of Proposed Project

21. **Project Rationale.** Kathmandu Valley is characterized by high urban population growth (estimated to be 6.6% per annum) and high population density (estimated to be more than 2,500 persons/km^2). The total population of Kathmandu Valley is estimated to be 2.72 million in 2011 and 3.5 million in 2016. Rapid and largely unplanned urban growth, high population density, lack of sustainable water sources, and inadequate past investments in water supply infrastructure have resulted in abysmally poor availability and quality of drinking water.

22. **Additional financing project.** The additional financing will (i) increase the number of beneficiaries with access to potable water and improved services in the Kathmandu Metropolitan Area and three additional municipalities in KUKL's service area through bulk distribution systems (BDS) and distribution network improvements (DNI); (ii) replace more of the existing, dilapidated network, with estimated average physical losses of more than 45%; (iii) double the current capacity of the Sundarijal water treatment plant (WTP) to 170 million liters

per day (MLD), the volume to be transported from the Melamchi River;[6] (iv) plan and prepare the pipeline of investments required to meet 2025 demand; and (v) strengthen the Kathmandu Valley water sector institutions.

23. **Components.** Table 1 provides the project components. The impact will be sustainable water supply services for residents of Kathmandu Valley. The outcome will be improved access, efficiency, and reliability of water supply services to residents of Kathmandu Valley, including poor women and men. The impact and outcome statements are unchanged from the original project.

Table 1: Proposed Water Supply Project Investments

Component	Package No.	Description	Details
BDS 2	KUKL/BDS-SR/02 (Package-2)	Construction of main pipelines for bulk water distribution system Ring Main and Service reservoir	Length of Pipe = 24.85 km Diameter (dia) of Pipe – 400 to 1100 mm dia. Ductile Iron Pipe Nos of RVT – 2 Nos Total Capacity – 17,000 cu.m.
BDS 4	KUKL/BDS-SR/04 (Package-4)		Length of Pipe = 8.06 kms Dia of Pipe – 400 to 700 mm dia. Ductile Iron Pipe Nos of RVT – 3 Nos Total Capacity – 15000 cu.m.
DNI 7		replace existing, dilapidated network	Length of Pipe – 210 kms Pipe Size DI – 100 to 600 mm diameter Pipe Size PE – 50 to 100 mm diameter
DNI 8			Length of Pipe – 82kms Pipe Size DI – 100 to 500 mm diameter Pipe Size PE – 50 to 100 mm diameter
WTP expansion		double the current capacity of the Sundarijal WTP to 170 MLD	Construction of WTP to treat 85 MLD water with all required necessary units. Required water from Tilrace channel of the Melamchi diversion scheme (MDS) at Sundarijal shall be received by the WTP at Sundarijal. A conventional gravity WTP is proposed to treat raw water to World Health Organization (WHO) drinking water standards. The major components of the WTP are: (i) cascade weirs for aeration, (ii) rectangular sedimention tanks, (iii) rectangular sedimentation tanks, (iv) rectangular open filters with backwash facilities, (v) treated water storage reservoirs, (vi) sludge lagoons, (vii) chemical building, and (viii) an administrative building. For the treatment of raw water, chemical aids such as alum, lime, chlorine, polyelectrolytes etc. are proposed for use for coagulation and disinfecting.

ha = hectare, km = kilometer, m^3= cubic meter, mm = millimeter.

[6] Phase 1 of the Sundarijal water treatment plant (85 MLD) is financed by JICA and completion is expected in 2016. The second WTP (capacity of 85 MLD) will be financed under the additional financing of the KVWSIP.

24. In addition to the original project targets,[7] the additional financing will support institutional strengthening through: (a) implementation of the NRW action plan, such as rolling out network management protocols and realignment of KUKL staffing for a NRW-oriented structure; (b) computerization of KUKL's billing and accounting system; and (c) supporting the implementation of the Reform Roadmap for improving water service delivery in the Kathmandu Valley.

C. Overall Project Implementation Plan

25. The project will be implemented over 5 years. The overall project (Loan 2776 and additional financing) implementation schedule is in Table 2.

[7] The targets include (i) achievement of time-bound targets as per KUKL's business plan (2012-2016), (ii) operationalization of the NRW assessment and reduction plan; (iii) operationalization of the asset management plan; (iv) updating of the water supply GIS database; (v) improvement of KUKL's responsiveness to customers; (vi) undertaking community participation and public education for health, hygiene, and behavior change; and (vii) implementation of the gender equality and social inclusion (GESI) action plan.

Table 2: Overall Project Implementation Plan

Activities	2015 (QTR)				2016 (QTR)				2017 (QTR)				2018 (QTR)				2019 (QTR)				2020 (QTR)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	
A. DMF																								
Output 1 Water supply infrastructure rehabilitated and expanded																								
Implemented by PID (Loan 2776-NEP)																								
Construction of BDS 1																								
Construction of BDS 2																								
Construction of BDS 3																								
Construction of DNI 1, DNI 2, and DNI 3																								
Design of Small Works																								
Design and Supervision of BDS and DNI																								
Implemented by PID (Loan 2776-NEP AF)																								
Obtain necessary environmental clearances from government																								
Detailed engineering designs and bidding documents																								
Construction of BDS 2																								
Procurement of civil works contracts for BDS 4, DNI 7, DNI 8																								
Award of civil works contracts																								
Construction of BDS 4, DNI 7, DNI 8																								
Installation of bulk and household meters completed and tested																								
Procurement of small works																								
Implementation of small works																								
Implemented by MWSDB (Loan 2776-NEP AF)																								
Procurement of design consultant for Melamchi Phase 2																								
Preparation of bidding documents for Sundarijal WTP expansion																								
Procurement of civil works contract for Sundarijal WTP expansion																								
Construction of Sundarijal WTP expansion																								
Preparation of detailed engineering design and bidding documents for Melamchi Phase 2																								
Output 2 Operating and financial systems improved, and capacities strengthened (Loan 2776-NEP and Loan 2776-NEP AF)																								
Activity 2.1 Improvement of financial management of KUKL																								
Activity 2.2 Implementation of capacity building initiatives																								
Activity 2.3 Installation of the computerized accounting and billing system																								
Activity 2.4 Adoption of tariff guidelines																								
Activity 2.5 Adjustment of water tariff																								
Activity 2.6 Implementation of NRW assessment and reduction plan																								
Management Activities (Loan 2776-NEP and Loan 2776-NEP AF)																								
Establishes a coordination unit for institutional strengthening																								

Activities	2015 (QTR)				2016 (QTR)				2017 (QTR)				2018 (QTR)				2019 (QTR)				2020 (QTR)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	
Implementation of GESI, CAPP																								
Adopt GESI action plan by KUKL																								
Establishment of project implementation unit for AF, PID and KVWSMB																								
Implementation of Environmental and Social Safeguard requirements																								
Annual/Mid-term review																								
Project completion report																								

AF=additional financing, BDS= Bulk Distribution System, CAPP = community awareness and participation plan; DMF=design and monitoring framework, DNI= distribution network improvement, GESI = gender equality and social inclusion, KVWSMB = Kathmandu Valley Water Supply Management Board, KUKL = Kathmandu Upatyaka Khanepani Limited, MWSDB=Melamchi Water Supply Development Board, NRW=nonrevenue water, PID=Project Implementation Directorate, WTP = water treatment plant.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Kathmandu Valley

26. Geographically, the Kathmandu Valley lies between latitudes 27º35' to 27º48'N and longitudes 85º12' to 85º33'E. The altitude of the district ranges between 1,372 m and 2,732 m above mean sea level. The major rivers flowing in the district are the Bagmati River, Bishnumati River, and Manohara River. The Bagmati River runs for 28 km within Kathmandu Valley. The Bishnumati, Manohara, Dhobikhola, Nagmati, and Balkhu Rivers are the main tributaries of the Bagmati River, which is important not only as a water source, but also from a religious point of view. One of the most famous Hindu temples, the PashupatiNath Temple, is located on the banks of the Bagmati River.

27. Bhaktapur, one of the adjoining cities of Kathmandu, is located between latitudes 27º 37' to 27º44'N and longitudes 85º 02' to 85º 32'E. It is bounded by Kavrepalanchowk in the east, Kathmandu and Lalitpur in the west, Kathmandu in the north, and Kavrepalanchowk and Lalitpur in the south. The average elevation ranges from 1,372 m to 2,166 m above mean sea level. Rivers and streams are the predominant water resource in the Bhaktapur district. The main rivers are the Hanumanate and Manohara. The Bagmati River does not flow through Bhaktapur, but the Manohara and Hanumante are both major tributaries of the Bagmati River.

28. Lalitpur is another adjoining city of Kathmandu, and is located between latitudes 27º22 to 28º50'N and longitudes 85º14' to 85º26'E. It is bounded by Kavrepalanchowk in the east, Makwanpur in the west and south, and Bhaktapur and Kathmandu in the north. The Bagmati River flows as the boundary between Lalitpur and Kathmandu. The major tributary of the Bagmati River in the Lalitpur district is the NakkhuKhola.

29. The Kathmandu Valley is accessible by major roads to different parts of the country, and to India in the south and People's Republic of China (PRC) in the north. Kathmandu has an airport that caters to national and international airlines that fly to many parts of the country and abroad.

B. Topography, Geology and Soil

1. Topography

30. The Kathmandu Valley is about 1,300 m above mean sea level, with an area of about 340 km^2. The valley has a bowl-like structure, surrounded by high hills, and the altitudes from the valley floor range from 500 m to 1,400 m. It lies between the Himalayas in the north and the Mahabharat range in the south. The prominent boundary features of the valley are Phulchowki Hill (3,132 m) in the southwest, Shivapuri (2,713 m) in the north, Chapa Devi (2,400 m) in the southwest, and Nagarjun (2,100 m) in the west. The major rivers flowing in the district are the Bagmati, Bishnumati, and Manohara Rivers.

2. Geology and Soils

31. The Kathmandu Valley is a synclinal tectonic basin, consisting of fluviolacustrine deposits from the Pleistocene age resting on top of Precambrian metamorphic bedrock. In Kathmandu municipality, the Gokarna and Kalimati formations are predominant, Gokarna to the northeast and Kalimati to the southwest. Bhaktapur city is located on a hill that is part of the Kalimati formation. In Latitpur municipality the Kalimati and Chapagaun formations are predominant. The Gokarna formation typically consists of light to brownish-grey; fine laminated and poorly graded silty sand, with intercalations of clay of variable thickness. Shallow sand and poorly graded (SP) soils, which are highly prone to liquefaction even with small to moderate-intensity earthquakes (i.e., levels VII-VIII), are often found within the Gokarna formation.

32. The Kalimati formation is made of gray to dark silty clay and clayey silt. Organic clay, fine sand beds, and peat layers are commonly found. Silty-sand soil layers intercalated with silt or clay layers are often found from 5 m to 15 m down. Such layers are prone to liquefaction under moderate to high-intensity earthquakes (i.e., levels VIII-IX).

33. The Kalimati formation surrounds the Jawalakhel and Lagankhel hills, which are located on the Chapagau formation. At Jawalakhel Chowk, a soil investigation conducted by JICA under the Study on Earthquake Disaster Mitigation in Kathmandu Valley, 2000–2001, found a nonliquefiable soil profile of good strength capacity. Most of the soils with moderate to high liquefaction potential are to be found along riverbanks in the so-called recent flood plains. Generally, apart from soils located at the foot of mountains, soils in the Kathmandu Valley located above 1,300 m are expected to be either non-liquefiable or to have a low liquefaction potential.

C. Climatic Condition

34. Nepal receives about 1,500 mm of rainfall in a good monsoon regime in one year (DHM records). Rainfall is concentrated, and more than 75% of the annual rainfall occurs during the monsoon months from June through September. The months between October and May are dry, and any rainfall is sporadic. In the winter, rainfall is caused by the weather system originating in the Mediterranean. The winter rain reaches Nepal and causes significant precipitation in the west.

35. The climatic condition of the Bagmati watershed is quite variable because of the intricate topography. Temperature generally decreases with elevation, and is low in winter. With the advent of spring, the temperature increases. Climatically, the Bagmati watershed region can be classified into three regions:

(i) the tropical climate of the southern Terai, Bhabar, Chure (Shiwalik), and the Inner Terai, which has a mild and dry winter;
(ii) the warm temperate climate of the Mahabharat region above 2,000 m, with warm summers and cool winters; and
(iii) the cool temperate climate of the high Mahabharat region above 3,000 m, with cool summers and cold winters. Snow falls in the winter months and persists on the high slopes throughout the winter.

36. Rainfall occurs between the months of June and September due to the southeast monsoon. The humid monsoon air stream blowing from the Bay of Bengal is forced to rise as it meets the Himalayas. As a result, heavy rainfall occurs in some sections of the southern

Himalayan slopes. Rainfall is also high along the Chure range. Regions close to the Indian border receive about 1,500 mm of rain a year, while at the foothills of Chure, the annual rainfall reaches 2,000 mm. On the northern side of the Chure, the rainfall diminishes again. In the leeward side, rainfall is reduced due to rain shadow effects. The orographic effect is pronounced, and governs the rainfall pattern.

D. Water Quality

1. Surface water

37. Nepal is characterized by many small to large rivers, which flow from north to south. There are over 6,000 rivers in Nepal, and their total length exceeds more than 45,000 km. Out of the total numbers of rivers, 1,000 are more than 10 km long, and 100 are more than 160 km long. The surface water available is estimated to be around 224.7 billion m^3 per annum. In terms of flow rate, it is around 7,125 cubic foot per second (cusecs). Nepal receives a yearly average precipitation of more than 1,500 mm.

38. The Bagmati River forms a medium-sized river basin with a catchment area of 3,700 km^2 at the Nepal-India border. It extends between latitudes 20^0 42' to 27^0 50'N and longitudes 85^0 02' to 85^0 58'E. It originates from the Shivapuri hills in the Mahabharat range of mountains, and flows down south into the Terai plains before crossing the Indo-Nepal border. Along its course, the river passes through eight districts, namely Bhaktapur, Kathmandu, Lalitpur, Kavrepalanchowk, Makwanpur, Sindhuli, Rautahat, and Sarlahi. The basin as a whole can be divided into three parts:

(i) the upper Bagmati basin, comprised of Kathmandu Valley plus the upper part of the Nakhkhu Khola and Dakshinkali areas;
(ii) the Middle Bagmati basin, comprised of the remainder of the basin in the hills, including the Kulekhani Khola; and
(iii) the lower Bagmati basin, comprised of the basin in the Terai, plus some tributaries which originate in the Shiwaliks.

39. The major tributaries of the Bagmati River inside the Kathmandu Valley are Bishnumati, Balkhu, Tukucha, Dhobi Khola, Manohara, Kodku, and Nakhu Khola. These tributaries are highly polluted.

40. The biochemical oxygen demand (BOD) level in different stretches of the Bagmati River in different seasons provides a clear indication of the high level of pollution all year round. (BOD levels range from 1.7 mg/l to 239.4 mg/l in the pre-monsoon, 2.1 mg/l–84.7 mg/l in the monsoon, and 2.3 mg/l–119.4 mg/l in the post-monsoon season). The main reason for the deteriorating water quality of the valley's rivers is discharge of untreated sewage from the urban areas of Kathmandu, although solid waste dumping along the river is also a contributing factor. [1]

[1] KVWMP will rehabilitate and expand the sewerage network, modernize and expand wastewater treatment plants, and improve wastewater management in the Kathmandu Valley that will help reduce pollution of the Bagmati River. The total treatment capacity is to be brought up to 90.5 MLD. The full amount of 170 MLD from the improved water supply system will not be discharged as wastewater since a portion is absorbed. Usually 70-80% of water supply that needs to be treated (and 60-70% in water scarce environments). KVWMP is the 1st phase of investment for wastewater management, and increasing the treatment capacity to 90 MLD will be a big achievement. In line with its capital investment plan, the government will further increase wastewater treatment capacity with subsequent phases. In the meantime, wastewater treatment will be supplemented by Dewats (under KVWMP) and other on-site sanitation solutions.

2. Groundwater

41. The groundwater aquifers of the Kathmandu Valley have been divided into three districts: Northern (157 km^2 with 59 km^2 recharge area), Central (114 km^2 with about 6 km^2recharge area) and Southern (55 km^2 with about 21 km^2 recharge area) (Dixit and Upadhya, 2005). The heavy extraction of groundwater to meet domestic as well as commercial demands is alarming, and leads to the depletion of the groundwater level. There is haphazard extraction of water from both shallow and deep aquifers in Kathmandu Valley. According to the hydro-geological conditions of the valley and the recharge rate of the basin, only 15 MLD of groundwater can be safely extracted in a day (JICA, 1990). This rate is exceeded by more than 70% through NWSC tube wells alone. Due to the increase of built-up areas, groundwater recharge is reduced with the rerouting of the natural drainage. The unsustainable extraction of groundwater causes land subsidence, which is already evident in many cities in Asia (e.g. Bangkok).

42. It is estimated that the groundwater of Kathmandu Valley is decreasing at an average rate of 2.5 m per year. However, it differs according to area, as the geological structure within the Kathmandu Valley is diverse.

43. Many households have installed pumps to extract groundwater from the shallow aquifer when NWSC could not meet their demands, but the bacteriological quality of the water is of concern and has to be looked into. There is an urgent need for legislation, rules, and regulations to stop groundwater mining in the Kathmandu Valley.

3. Groundwater quality

44. Of the 57 deep tube wells tested, many had water that exceeded Nepal standards for color and turbidity, as well as ammonia, iron, and manganese content. Water in two of the wells exceeded the arsenic standard. In some wells, ammonia concentration in the water was found to be extremely high, at 50 times the threshold value of 1.5 mg/l. Water in 20 of the 57 wells showed bacterial contamination (ENPHO, 2009)

E. Air and noise pollution

45. **Air Quality, traffic management and noise pollution**: Increasing numbers of vehicles in Kathmandu Valley (274,000, based on the records of 2004-2005) have increased the air pollution load. Thirty-eight percent of the air pollution is due to vehicular movement; industrial emissions are also contributing substantially. The national ambient air quality standards are in Appendix 4. Recommended noise exposure limits for the work environment are in Appendix 5. Traffic management is critical for ensuring public approval of the works. The contractor is to prepare a traffic management plan and road safety plan. Some guidance for traffic management is provided in Appendix 6.

46. The Kathmandu Valley is particularly vulnerable to air pollution because of its bowl-shaped topography, which restricts air movement. The situation is worse during the winter, when temperature inversion during the night and early morning traps a layer of cool air under a layer of warmer air, trapping pollutants close to ground level for extended periods. Besides the topography, the relatively high elevation of the valley also results in increased vehicular emissions.

47. Vehicular emissions have become the main source of air pollution in Kathmandu Valley. An inventory of emission sources by the then Ministry of Population and Environment (MoPE) indicated that exhaust fumes had increased more than 4 times in the 8 years between 1993 and 2001. According to a more recent inventory, vehicular emissions are responsible for 38% of the total PM_{10} emitted in Kathmandu Valley, compared to 18% from the agricultural sector and 11% from brick kilns (**Table 3**). Increase in emissions is mainly due to the increase in the number of automobiles, as well as poor transport management and poor vehicle maintenance.

Table 3: Comparison of Emission Inventories in 1993, 2001, and 2005

Sources	TSP (tons/yr)			PM_{10} (tons/year)		
	1993	2001	2005	1993	2001	2005
Mobile sources						
Vehicle exhausts	570	1,971	Not available	570	3,259	4,708
Road dust re-suspension	1,530	7,008	12,239	400	1,822	3,182
Subtotal	2,100	8,979	12,239	970	5,081	7,890
Stationary sources						
Industrial/commercial fuel	582	Not available	Not available	292	Not available	Not available
Domestic fuel combustion	2,328	Not available	630	1,166	NA	347
Brick kilns	5,180	6,676	1,850	1,295	1,688	1,437
HimalCement	6,000	3,612	0	800	455	0
Stone crushers	Not available	Not available	1,720	Not available	Not available	372
Industrial boilers	Not available	28	28	Not available	15	15
Fugitive emissions						
Refuse burning	385	687	172	190	339	172
Agricultural sector	Not available	Not available	Not available	Not available	Not available	2,337
Cremation	Not available	Not available	Not available	Not available	Not available	79
Total	16,575	19,982	16,797	4,712	7,580	12,649

TSP = total suspended particles
Source: Shah and Nagpal 1997; Gautam 2006; MOE 2005.

F. Ecological Resources

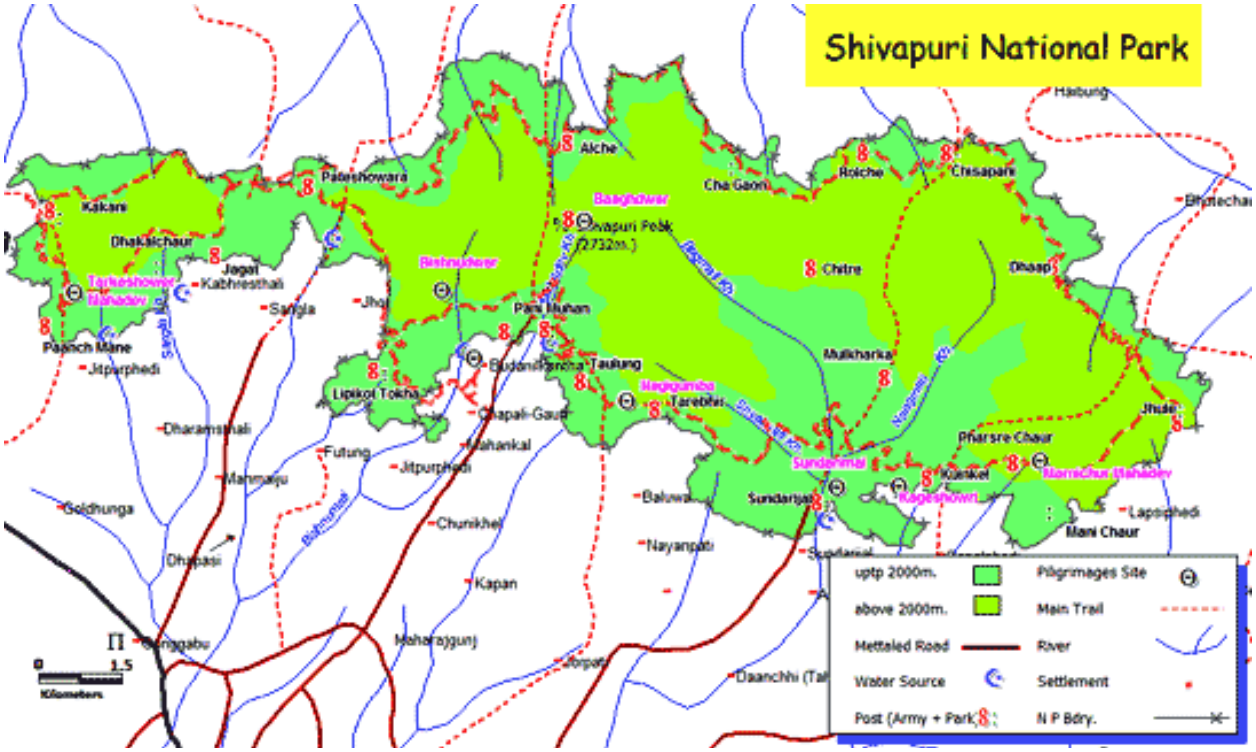
1. Shivapuri Nagarjun National Park

48. The Shivapuri Nagarjun National Park is the only national park near the Kathmandu Valley. Shivapuri is the second highest peak among the surrounding hills. It is 2,732 m high with numerous sharp ridges radiating to all sides. Situated north of the Kathmandu Valley, and due to its strategic location, Shivapuri was proclaimed a watershed area, and supplies more than a million liters of natural spring water to the city. After Shivapuri experienced several problems with soil erosion as a result of deforestation, overgrazing, and cultivation on steep slopes, reducing the quality and quantity of the water, the government initiated a program to protect Shivapuri and its adjoining areas as a watershed and wildlife reserve in 1975. In 2002, Shivapuri

Watershed and Wildlife Reserve was officially given national park status. In 2009, Nagarjun was appendixed to the Shivapuri National Park and renamed the Shivapuri Nagarjun National Park.

49. A new water supply service reservoir outside the park boundary and adjacent to the existing WTP at Balaju is proposed to be constructed on land acquired under Loan 1820-NEP (MWSP). The new reservoir will replace the existing 80-year-old reservoir, which is in a dilapidated state. The existing Balaju reservoir is located within the Nagarjun Park, and will be dismantled. A new 8,000-m^3 reservoir will be built on private land adjacent to the park boundary. There is an existing access road to the reservoir which is in good condition, and suitable for use by motor vehicles. The forest area will not be affected by the project. Shivapuri Nagarjun National Park (159 sq km) is situated on the northern fringe of Kathmandu valley and lies about 12 km away from the center of capital city. The area was gazetted as the country's ninth national park in 2002. Prior its declaration as national park, it was managed under the Shivapuri Watershed Development Board, and was later declared as Shivapuri Watershed and Wildlife Reserve. There is no buffer zone. The map of the Park has been given in Figure 1 below.

Figure 1: Shivapuri Nagarjun National Park



50. To minimize adverse impacts, the new feeder main (150 m in length, 800 mm in diameter) will be constructed to the new proposed reservoir, following the existing access road. However, the existing pipeline corridor now lies within the Shivapuri Nagarjun National Park, whose boundary was recently extended. For installation of the new feeder main, it is proposed that the pipeline will follow the existing access road to avoid the cutting of trees. The exact number (if unavoidable) will be determined during detailed design to be done by the DSC. A provisional sum of funds is set aside by PID to cover such costs if necessary. However, there is no anticipated threat to the ecological integrity or biodiversity of the park, given the rehabilitation nature of the works at existing facilities and locations.

2. Forests

51. The Kathmandu Valley has 20,945 ha of forests, which constitutes 32.7% of the valley's total area. Except in a few conservation areas, the natural vegetation has been under intense pressure. The area under natural forest cover, excluding shrubs, is 9,580 ha (45.7% of the total forest land), of which only about 22% has good forest cover, with more than 50% of crown coverage. Mature hardwood forests are now confined to parks and sacred areas such as Nagarjun (Raniban), Gokarna, Shivapuri National Park, and Bajrabarahi forest. Shrubland occupies nearly 34% of the total forest area.

52. The forests in the valley are not in good condition, and most are in the regenerating stage. The crown coverage of rhododendron and quercus is more than 70%, and the crown coverage of *Pinusroxburghii*, and *Schimacastonopsis* is less than 40%. About 1,312 plant species belonging to 162 vascular families are found in the valley, representing 26% of the total species of plants recorded in Nepal. About 7 species of gymnosperms, 170 species of ferns, and 97 species of orchids are found in the valley. About 256 species of birds have been reported from the Phulchowki area, and many birds are found in Nagarjun, Shivapuri, Tuadaha, Tokha, and Bajrabarahi. Many migratory birds are found at Taudaha pond. About 33 bird species have disappeared due to habitat destruction. Some patches of forest exist in Bajrabarahi, Hattiban, Balkumari, KaryaBinayak, Mhaipi, Pashupatinath, Raniban, and Bansbari. These are mostly eucalyptus, *Proteasp*, *Jacaranda sp*, and camphor trees. Green belts are found in some city areas. *Populussp* and *Eucalyptus sp* are mostly found along the ring road.

53. The Nagarjun National Park (15 km^2) was annexed in 2009 to the Shivapuri National Park (144 km^2) and called the Shivapri Nagarjun National Park to provide an extended habitat for the wildlife population and as a representation of intact mid-hill forest ecosystems, which are decreasing in the protected area system. The Shivapuri Nagajun National Park is one of the primary sources of freshwater for the Kathmandu Valley, providing about 40% of the drinking water (Department of National Parks and Wildlife Conservation, 2009).

3. Flora

54. Since Shivapuri lies in the transition zone between a subtropical and temperate climate, the vegetation consists of a variety of natural forest types, depending on altitude and aspects. Most of the areas below 1,800 m are covered with *Schimacastanopsis* forest, in which pines (*Pinusroxburghii*) appear on the southern dry ridges, and *utis* (*Alnusnepalensis*) grow along the streams. A forest of oak species such as *Quercussemicarpifolia* and *Quercuslamelosa,* mixed with rhododendron and a variety of orchids, flourishes on the northern slopes. There are more than 2,122 species of flora, and 16 of them are endemic flowering plants in the ShivapuriNagarjun National Park. A variety of medicinal herbs are found at higher altitudes. There are 129 species of mushrooms that have been identified and catalogued in the park.

4. Fauna

55. The Shivapuri National Park is home to 311 species of birds, 21 species of mammals, and more than 102 species of butterflies, some endemic and rare. This is out of the total of 800 species of birds, 130 species of mammals (of which 11 are threatened), and 600 species of butterflies found in Nepal, thus making the national park truly rich in flora and fauna. The threatened wildlife found here are wild boar (*Sus scrofa*), barking deer (*Muntiacusmuntijak*),

rhesus monkey (*Macacamulata*), porcupine (*Hystrixindica*), goral (*Naemorhedus goral*), Himalayan black bear (*Ursusthibetanus*), leopard (*Pantherapardus*), pangolin (*Manis spp.*), clouded leopard (*Pardofelisnebulosa*), leopard cat (*Primailurusbengalensis*), and jungle cat (*Felischaus).*

G. Socio-economic Conditions

1. Social and Household Profile

56. **Social classification**: According to a 2011 census, the majority of the people living in the valley are Hindus (80%), followed by Buddhists (15%). The percentage of other religions living in the valley is minimal. The households are divided into different ethnic groups, such as Newar, Brahmin, Chettri, Tamang, and Magar. Newar are the prominent inhabitants, followed by Brahmin, Chettri, Tamang, and Magar. These ethnic groups are not at the same level of socio-economic development. In the Kathmandu Valley, Newar are considered an advanced indigenous people group. This group comprises about 40% of the valley population. Besides Newar, Brahmin (17%) and Chhetri (20%) are the major ethnic groups. Similarly, Tamang constitute about 7% and Magar hold 3% of the total population of the valley.

57. **Age:** The economically active age group between 15 and 59 years constitutes about 71% of the valley population. The other main age group is between 0 and 14 years. Only about 7% of the population are over 60 years old. There are no significant differences in the percentage of age distribution in KUKL service areas.

58. **Table 4** summarizes the distribution of gender and households, and the literacy rate of the five main districts in the valley.

Table 4: **Household Profile in Kathmandu Valley**

Metro/Sub-metro/ Municipality and VDCs covered	Population			Total Households	Average Size of Households	Literacy Rate
	Male	Female	Total			
Kathmandu Metro	511,841	463,612	975,453	254,292	3.8	88.52
Kirtipur Municipality	36,476	29,126	65,602	19,441	3.4	86.8
Lalitpur Sub- Metro	113,781	107,021	220,802	54,581	4.0	87.37
Bhaktapur Municipality	41,081	40,667	81,748	17,693	4.6	81.21
MadhyapurThimi Municipality	42,723	40,313	83,036	20,302	4.1	83.84
	745,902	680,739	1,426,641	366,309	3.9	

VDC = Village Development Council.
Source: Compiled from Census 2011, CBS.

2. Employment

59. The economy of the Kathmandu Valley is based on trade, commerce, and manufacturing industries like carpets and garments. Other economic sectors are foreign employment, agriculture, education, transport, hotels, and restaurants. Tourism is also a key component of the valley's economy. However, in the rural areas, the economy is still based on agriculture.

60. Kathmandu Valley has developed as a centre of trade links with India and PRC. According to the Economic Survey 2008/2009, in the fiscal year 2007/2008, Nepal exported 65% of its goods to India and 35% to other countries like Canada, Germany, Italy, Japan, the UK, and the US. The main export commodities are ready-made garments, woolen carpets,

woolen and pashmina goods, and handicrafts, most of which are manufactured in the Kathmandu Valley. The majority of goods imported from other countries are also handled through the Kathmandu Valley. The valley is the entry point for most tourists. In 2008-2009, a total of 409,100 tourists (excluding Indians) arrived in Nepal, of which more than 90% entered through the Kathmandu international airport.

61. About 78% of the total population in the valley aged 15 and above are economically active (Census 2011). Majority of the population of the Kathmandu Valley are engaged in agriculture. The other major industries are manufacturing (24%), trade (42.6%), service (28.6%) and others (4.7%) (source-NLSS statistical report vol-2.2/2011).

62. Table 5 summarizes the economic activities in the urban areas of the Kathmandu Valley. About 34% of the households are engaged in small-scale non–farm activities. The Lalitpur municipality has the highest percentage (50%), whereas the Kirtipur municipality has the lowest (13%). Among the households engaged in non-farm activities, nearly 45% are engaged in trade and business, followed by services (32%) and manufacturing (9%). Nearly 50% of the households of Kirtipur and Kathmandu are engaged in trade and business.

Table 5: Households Engaged in Non-Farm Economic Activities in Kathmandu Valley

Municipalities	Percentage of Households Engaged in Non-Farm Activities	Type of Activities				
		Manufacturing	Trade/ Business	Transport	Services	Others
Lalitpur	50.18	13.25	33.22	4.29	42.37	6.86
Bhaktapur	40.83	13.24	38.55	4.26	26.54	17.40
MadhyapurThimi	35.02	11.39	41.88	4.48	23.26	18.98
Kathmandu	31.57	6.86	49.49	3.49	30.26	9.90
Kirtipur	13.34	9.72	51.42	2.84	22.83	13.19
Total	**34.43**	**9.02**	**44.66**	**3.76**	**32.41**	**10.14**

Source: Population Census 2001 (selected urban tables), CBS 2003.

63. **Table 6** indicates that the human development index in the Kathmandu Valley is much better than the national level, based on the 2011 Census.

Table 6: Kathmandu Valley Development Indicators

Districts	Human Development Index (HDI)	Human Poverty Index (HPI)	Gender-Related Development Index (GDI)
All Nepal	0.458	31.12	0.534
Kathmandu	0.666	22.45	0.635 *
Lalitpur	0.640	19.18	0.569 *
Bhakltapur	0.618	19.43	0.578 *

GDI = Gender-related Development Index, HDI = Human Development Index, HPI = Human Poverty Index.
Source: Census 2011, Nepal Human Development Report by UNDP 2014.*HDR/UNDP2004.

3. Slums and Squatter Settlements

64. The rapid population growth has created a number of slums and squatter settlements in the Kathmandu Valley. Table 7 summarizes the findings of a survey conducted by LICSU, KUKL in 2008. There were 39 squatter settlements and 137 slums in the Kathmandu Valley, where a population of 40,237 live in 8,846 households. Of these, 22% had no access to piped water supply, and none had adequate sanitation.

Table 7: Slums and Squatter Settlements in Kathmandu Valley

Type of Residence	Number of Households	Total Population	Average Household size	Percentage of Households Without Piped Water Supply
Slums				
Bhaktapur Municipality	754	3,274	4.34	32
MadhyapurThimi Municipality	382	1,981	5.19	85
Lalitpur Sub - Metropolitan	391	1,866	4.77	62
Kathmandu Metropolitan	3,784	16,575	4.38	58
Kirtipur Municipality	1,674	7,767	4.64	64
				Squatters
Kathmandu Metropolitan	1,861	8,774	4.71	95
Total	**8,846**	**40,237**	**4.5**	**21.98**

Source: Mapping of Slums, Squatters and Stand Posts in Kathmandu Valley updated by LICSU, KUKL, June 2008, AVIYAAN Consulting (P) Ltd.

65. Due to constraints in supply, KUKL is unable to supply the required water to these unregulated settlements. To help manage the water supply and sanitation problem in these areas, the government established the Low Income Consumer Support Unit (LICSU) in KUKL in 2008. The basic objective of LICSU is to serve drinking water to the urban poor. It has started to construct water tanks and stand posts and rehabilitate broken stand posts. In 2008, it was found that 395 public stand posts (38% of the total) were not working. However, KUKL has managed to distribute drinking water to these settlements through its own water tankers.

66. As KUKL is unable to provide adequate drinking water and sanitation services to the increasing slum and squatter settlements, the government has adopted a policy of handing over completed schemes to user groups for operation and management. For this, user groups are required to share at least 20% of the total cost of the scheme. As a result, there is a significant number of water user groups in the Kathmandu Valley who are involved in operation and management of drinking water systems and sanitation in different places.

4. Economic Development

67. In comparison to the rest of Nepal, the Kathmandu Valley possesses basic facilities like water supply, sanitation, electricity, bottled gas, telecommunications, roads, education, security, and transportation. The valley is also the center for several major industries, such as textile, food and beverage, non-metallic mineral products, publishing, and printing. Such facilities and opportunities are a huge attraction to the rural poor, resulting in high migration rates; hence, the rapid population growth and demand for urban services, especially water supply.

68. The valley's annual industrial output is estimated to be NRs.14.6 billion ($190 million), nearly 9.4% of the total national industrial output. The industrial sector employment is about 37,500 in the Kathmandu Valley, which is 22.1% of the national employment figure in the

industrial sector. Similarly, indirect employment in the industrial sector is about 38,900, about 21.9% of the national figure.

69. Being a capital city and commercial centre for the country, Kathmandu and its surrounding valley is developing and urbanizing fast in comparison to the rest of Nepal. The Kathmandu Valley is the most important urbanized area in Nepal. New products and services are first introduced in the valley, giving inhabitants access to modern equipment and technology. An indication of confidence in economic growth is the high demand for new housing real estate and the number of new vehicles on the roads, which is rising rapidly. In addition, there are plans for major transportation improvements, such as the Kathmandu outer ring road and the new link road to India via the Terai.

5. Land Use

70. The land use and land cover statistics (Table 8) derived from the 1992 topographical sheet shows that almost 50% of the Bagmati watershed is occupied by forests. High relief areas of the Midlands and the Mahabharat range are characterised mainly by deciduous and coniferous forests, while hardwood and mixed hardwood forests characterize the Shiwaliks and low-lying areas of the Midlands and the Mahabharat range. Next to the forests are cultivated lands, which cover about 37% of the total area. The agricultural activities are confined mainly in the river valleys and the gentle slopes of the hilly region. Built-up areas occupy an insignificant portion, less than 1%, of the total area. The metropolitan city of Kathmandu, submetropolitan city of Lalitpur, and municipal cities of Bhaktapur, Madhyapur Thimi, and Kirtipur are the major built-up areas in the watershed.

Table 8: **Land Use and Land Cover in the Bagmati River Basin**

Land Use/Land Cover	Area (hectares)	Percent
Forest	186,340	49.6
Cultivation	141,986	37.8
Sand	18,118	4.8
Bush	13,367	3.6
Grass	5,241	1.4
Channel	4,441	1.2
Built-up area	2,378	0.6
Barren land	1,264	0.3
Orchard	785	0.2
Scattered tree	551	0.1
Nursery	360	0.1
Pond or lake	141	0.0
Others	628	0.2

Source: Preparation of Water – Induced Hazard Maps of Bagmati River Basin, 2005, WIDP/SILT/ERMC/TECHDA.

6. Infrastructure

7. Transportation

71. Long-distance bus services from Kathmandu provide services to people throughout the country. Private transport includes buses, microbuses, vans, cars, jeeps, and three-wheelers, operated by petroleum, liquid petroleum gas (LPG), and batteries. The total length of roads in Kathmandu, Lalitpur, and Bhaktapur is 813 km, 337 km, and 181 km, respectively, for a total of 1,331 km (Department of Roads, 2004).

72. The Tribhuvan International Airport is just 30 minutes away from the centre of town. There are numerous daily flights from Kathmandu to international destinations, as well as regular flights to many areas of the country. Many international airlines fly to the Kathmandu international airport.

8. Drinking Water Supply

73. Not all households and people in the valley have safe drinking water. The dependence of households on a variety of sources for drinking water can be seen in Table 9.

74. Based on the 2005 data of the Department of Drinking Water and Sewerage, the percentages of the population receiving water by districts, and also for the Kathmandu Valley, are shown in Table 10. Less than 75% of the population receive drinking water supplies.

Table 9: Sources of Drinking Water

Item	Kathmandu		Lalitpur		Bhaktapur		Kathmandu Valley	
	Household	%	Household	%	Household	%	Household	%
Tap	197,851	84.1	57,237	83.0	30,755	73.5	285,843	82.6
Well	14,714	6.3	6,745	9.8	4,4843	11.6	26,302	7.6
Tube well	13,478	5.7	825	1.2	2,977	7.1	17,280	5.0
Spouts	6,082	2.6	3,099	4.5	2,632	6.3	11,813	3.4
River/stream	195	0.1	113	0.2	29	0.1	337	0.1
Others	1,616	0.7	477	0.7	277	0.7	2,370	0.7
Not stated	1,581	0.6	425	0.6	339	0.8	2,145	0.6
Total	**235,317**	**100**	**68,921**	**100**	**41,852**	**100**	**346,090**	**100**

Source: NWSC, 2005.

Table 10: **Population Receiving Drinking Water**

Districts	Estimated Population 2005	Population Benefiting 2005	Percentage Benefiting 2005
Kathmandu	1,246,110	947,630	76.05
Lalitpur	366,010	286,250	78.21
Bhaktapur	244,130	152,270	62.37
Total	1,856,250	1,386,150	74.67

Source: NWSC, 2005.

9. Surface Drainage, Sanitation and Sewerage

75. Storm water drainage systems in the valley function through side drains, but do not function well. The increased use of plastic bags has also worsened the problem, as drains are frequently clogged.

10. Electricity

76. Not all households in the valley have electricity. The proportion of households with electricity in Kathmandu, Lalitpur, and Bhaktapur are 96.81%, 87.64%, and 96.41%, based on

data from the Nepal Human Development Report 2001. The overall proportion of households connected to electricity is approximately 95%.

11. Educational Establishments

77. The Kathmandu Valley has long been the considered the center for higher education in Nepal. In 2007, there were 6,106 high school level institutions and 474 higher secondary, college, and university-level education institutions. The number of students enrolled during the period at the high school and higher education levels were 573,779 and 156,828, respectively.

78. Education has been progressing continuously, specifically in the Kathmandu Valley, and as a result, educational institutions, levels of education, and fields of study have been increasing. Table 11 shows the number of schools by level for the three districts.

Table 11: Total Number of Schools by Grades and Levels

Item	Primary	Lower Secondary	Secondary	Higher Secondary
Kathmandu	920	671	514	148
Lalitpur	277	147	108	47
Bhaktapur	243	137	85	9
Total in the valley	1,440	955	707	204

Source: Compiled from NIDI 2006; ICIMOD, MOE, UNEP, 2007.

79. Tribhuvan University, the national university, has 5 institutes (Engineering, Agriculture and Animal Sciences, Medicine, Forestry Science, and Science and Technology) and 4 faculties (Law, Management, Education, and Humanities and Social Sciences) which offer almost all the popular disciplines at different academic levels, including Master's and Doctoral degrees.

80. There are 3 medical and more than 12 engineering colleges offering up to Master's level education. The Council for Technical Education and Vocational Training is another regulatory body monitoring the curriculums for technical and vocational training, as well as diploma courses to produce skilled manpower.

12. Health Facilities

81. Kathmandu is a center for all types of health services (general medicine, surgery, heart care, orthopaedic care, kidney care, dental care, children's care, eye care, mental care, neurology, and others). The number of health facilities owned by the government or provided by NGOs and INGOs and the private sector is relatively better in Kathmandu than in other districts. More health institutions are available in Kathmandu than in Lalitpur and Bhaktapur. However, the number of people served by the health institutions in Kathmandu is less (1:9,574) than in Bhaktapur (1:5,637) or Lalitpur (1:4,119). This shows that the number of health institutions is low in comparison to the size of the population in Kathmandu.

13. Communications

82. There are 3,991 post offices, including the general post office, regional postal directorates, district post offices, area post offices, and additional post offices. A number of private postal care companies provide a wide range of postal services.

83. The telecommunication system in the Kathmandu Valley is excellent. As of 2005–2006, the Nepal Telecommunications' Authority has issued basic telephone service licenses to 2

agencies, cellular mobile service licenses to 2 agencies, and internet (including e-mail) licenses to 38 agencies (more than 50,000 customers).

14. Economic Characteristics

a. Industries

84. Kathmandu Valley has many traditional cottage industries (textile weaving with handlooms, bricks and tiles, pottery, handicrafts such as idol making), precious ornaments, traditional food processing and preservation (rice milling, beaten rice, oil milling, sweetmeats, and traditional dairy products), wooden furniture and carving, bamboo crafts, traditional textile printing and dyeing, traditional art and paintings, copper and brass metal utensils, herbal medicines, forges, and leather crafts.

85. Three industrial districts, namely Balaju Industrial District, Patan Industrial Estate, and Bhaktapur Industrial Estate, exist in the Kathmandu Valley. Public sector brick factories, leather tanning, and shoe manufacturing are also established. Food and beverages, plastic products, construction materials, carpets, and ready-made garment industries have flourished. However, the number of industries and the employment they provide have decreased drastically within the last decade. Industries are also concentrated along the Kathmandu-Bhaktapur and Kalanki-Thankot roads. Most of the polluting industries, such as textile dyeing, tanning, and distilling, have been closed or transferred to places outside the valley.

86. Of the remaining industries, the main polluting industries in the valley are only small scale, and these include

(i) brick kilns;
(ii) wool dyeing and carpet washing;
(iii) textile dyeing;
(iv) pottery;
(v) polyurethane and rubber foam;
(vi) beaten rice;
(vii) dairy products;
(viii) metal casting;
(ix) metal craft industries and gold plating; and
(x) alcoholic and non-alcoholic beverages.

87. With the increase in industrial pollution and rising awareness of the general public of the adverse impacts of industrial pollution, complaints were noted and measures taken to address the issue. The Industrial Promotion Board formulated an industrial location policy. There have been revisions to the policy, and the latest location policy for industries specifies the following:

(i) the types of industries (list A) that can be established in municipal areas of the valley;
(ii) the types of industries (list B) that are not allowed in the valley; and
(iii) all types of industries that have pollution prevention and safety measures, which can be established inside any designated industrial district.

b. Agricultural Development

88. Rice is the main crop in the rural areas of Kathmandu and Bhaktapur, while maize is the prominent cereal crop of Lalitpur. The other cereal crops in the project districts are millet, wheat,

and barley. Other agricultural produce such as lentil, soya beans, peas, and black gram are the main pulses grown, as well as potato and oil seeds.

89. Livestock rearing is the second most important activity. Most of the households in the rural areas rear animals for income, food, or draft power. Goats represent the highest number of domestic animals in Kathmandu Valley, followed by cattle and buffaloes, which have a ready market in the local city area.

90. Population increase in the Kathmandu Valley is bringing considerable changes to the cropping system. Rapid urbanization and the introduction of new agriculture technology have encouraged the valley's farmers to change from traditional crops (low value) to new crops (high value). Land under cultivation for green leafy vegetables is increasing rapidly in the urban and semi-urban areas.

91. The increased population growth and haphazard housing construction have resulted in the rapid decline of agricultural land. If this decline continues, it is expected that there will be no agricultural land left in the valley in the future.

c. Development Organizations

92. There are various NGOs and INGOs working in the water and sanitation sector in the valley. These organizations have focused mostly on slums, squatter settlements, and rural areas of the Kathmandu Valley. They have constructed water tanks of 5-m^3 capacity and a number of latrines or toilets with drains in these communities. The major NGOs and INGOs working in the water and sanitation sectors are:

(i) Lumanti Support Group for Shelter;
(ii) NGO Forum for Urban Water and Sanitation;
(iii) Centre for Integrated Urban Development;
(iv) Environment and Public Health Organization (ENPHO);
(v) Nepal Water for Health (NEWAH);
(vi) Action Aid;
(vii) Water Aid;
(viii) Plan International;
(ix) UDLE (Urban Development through Local Efforts); and
(x) Red Cross.

H. Physical and Cultural Resources

93. The Patan Darbar Square and the Kathmandu Darbar Square, two UNESCO World Heritage Sites, are within the project area. The project will lay small diameter pipes (around 150 mm) along the roadways, and no impacts to buildings or heritage sites are anticipated. Consultations with UNESCO and the Department of Archaeology were conducted during the preparation of this IEE, and will continue throughout implementation. Chance find procedures and special construction measures are included in the EMP to ensure no impacts to physical cultural resources. Approval from Department of Archaeology will be obtained during detailed design phase and requirements/conditions, if any, will be incorporated in the updated IEE and EMP.

94. **Settlement patterns:** Kathmandu Valley is developing haphazardly with the tremendous increase in population. It is estimated that, there will be nearly 4 million people within the valley by 2025, compared to only 1.3 million in 2001. The valley's fertile lands are being fragmented,

and construction of residential houses is going on unabated. This kind of growth has created problems in transportation, electricity supply, drinking water supply, and river pollution resulting in human health hazards.

95. **Water resources:** An extensive deterioration in river water quality and quantity in urban areas due to excessive pollution has already taken place. Increasing demand for drinking water has strained insufficient supplies and created water scarcity. Almost all major rivers have been tapped at source for drinking water supplies. The current water supply is only about 140 MLD during the rainy season and 100 MLD during dry season, with the estimated daily demand at 190 MLD. In the dry season, 60%-70% of the water supply comes from groundwater.

96. **Waste management**: The five municipalities generate approximately 435 tpd of solid waste, of which more than 70% comes from the Kathmandu metropolitan city. The final disposal sites are always controversial and opposed by the local people. Most of the time, the solid wastes have been disposed of at the riverbanks and in open areas. The current location of disposal is at Sisdol, 25 km west of Kathmandu. However, Sisdol was designated a landfill site for only three years, which have already passed. A new municipal waste disposal site has been identified, and is in the process of being developed.

97. The Solid Waste Management National Policy (1996) of what was then His Majesty's Government (HMG) mentions that there are no proper statistics on the nature, volume, collection, transportation, and final disposal of different types of solid wastes generated in city areas. The privatization of solid waste management is one of the objectives of the policy.

98. The daily solid waste generation is assumed to be 0.25 kg per person per day. Studies have revealed that the composition of solid waste in Kathmandu is mainly organic (58%-66%), with 5% plastics. The use of plastic bags has increased over the years, and since it is nonbiodegradable, its use should be discouraged or even banned.

99. A major issue is the huge amount of solid waste in the Kathmandu Valley that accumulates from time to time, due to the demands of the people near the landfill site who block the way of the trucks carrying the solid waste. Another major issue is the dumping of hazardous and infectious wastes of hospitals and nursing homes together with domestic solid wastes.

100. Most of the plastics and reusable materials like bottles, metals, and others are picked up daily by scavengers, who are helping the municipality by reducing waste volume. Tourism is Nepal's topmost industry, and if it is to thrive, solid waste management should be managed well in all the municipalities and given top priority.

101. **Natural disaster preparedness:** Earthquakes and landslides are the two most prominent potential natural disasters in the Kathmandu Valley. The valley is located in a seismic zone; lack of public awareness about earthquakes, lack of adequate planning, and lack of coordination are the main factors that impact negatively on disaster preparedness. Excavation of slopes, deposition of loads on slopes, deforestation, irrigation, mining, and water leakage are the main human activities causing landslides.

102. **Water quality:** Bacteriological water quality deterioration during transmission is a problem in almost all urban areas due to the ingress of polluted water into the pipes because of intermittent supply, leakage, absence of chlorination, and no monitoring of water quality. Almost all available reports on the quality of the drinking water in Kathmandu reveal that most of the

urban water supply is bacteriologically contaminated (**Table 12**). The chemical quality of most of the water is within WHO guidelines.

103. Most of the people of Kathmandu do not trust the quality of the water provided, so they boil the water before drinking. A small calculation shows that each household spends 30% more on top of the monthly water tariff for boiling and pumping. This excludes the cost of the storage reservoir and the overhead tank. This is a positive sign that people are willing to pay more for a reliable and safe supply of water.

Table 12: **Water Quality of Different Water Sources, Kathmandu Valley**

Parameters	**Water Sources**				**WHO GV**
	PTW	**PUTW**	**Well**	**SS**	
pH	6.5-8.2	6.5-7.5	7.5	7.5	6.5-8.5
Temp (oC)	13-18	12-15	15-18	15-18	25
Iron (mg/l)	ND-0.2	0.2	0.2	0.3	0.3-3.0
Chlorine (mg/l)	ND	ND	ND	ND	0.2
Chloride (mg/l)	10-30	22-45	22-45	23-45	250
N-NH4 (mg/l)	ND-0.2	0.2	0.2	0.2	0.04-0.4
PO4 – P (mg/l)	0.1	0.1	0.1	0.1	0.4-5.0
*E.coli*cfu/100 ml	10-131	3-20	48-200	58	0

PTW = Private tap water, PUTW = public tap water, SS = stone spout, WHO GV = World Health Organisation guideline value.
Source: Pradhan et al. 2005.

104. **Health and sanitation:** There are individual septic tanks and soakpit systems and some pour-flush latrines and pit latrines in urban areas. There is pollution of groundwater due to the leachate, but the extent has not yet been quantified. Most of the effluent reaches the municipal drains, and ultimately, the rivers or agricultural lands. People without toilets defecate in open fields and banks of rivers. Public latrines hardly exist in urban towns, and if they do, they are very poorly maintained.

105. The Bagmati River is the main river system, with tributaries that drain the Kathmandu Valley. The visible pollution of the Bagmati and its tributaries within the city due to discharge of untreated domestic sewage, dumping of solid wastes, washing of vehicles, sand quarrying, and discharge of untreated industrial and hospital wastes is severe.

106. The treatment plants in Greater Kathmandu are non-functional. Many sewers overflow, as there is no regular cleaning and maintenance. UN Habitat estimated that there are 77,000 septic systems in the valley. Only 35% have a soak pit associated with a septic tank. The remaining tanks presumably discharge septic tank effluent directly to surface flows.

107. Storm water drains constructed more than 60 years ago in core areas are being used as combined sewers. Sanitary sewers have been added to some areas of Greater Kathmandu, and there are about 96,000 sewer connections (KUKL Annual Report, 2008). The rest discharge the effluent ultimately to the holy Bagmati River.

108. Not all households in the valley have toilet facilities. The households with toilets are at 81% in Lalitpur district, 90% in Bhaktapur district, and 92% in Kathmandu district (CBS 2001). Most of the households' toilets do not have septic tanks, and are directly connected to the sewerage lines that discharge into the nearby river. For the households with septic tanks, a municipal service is available for emptying the tanks on a demand basis. But even the municipal

authority allows the septage being pumped up from the septic tanks to be dumped on the banks of nearby rivers. The MOE is mandated to regulate unauthorized dumping. Domestic wastewater makes up approximately 93% of the total wastewater generation in the cities, and the remaining 7% is industrial wastewater. **Table 13** shows the wastewater generated in different municipalities.

Table 13: Estimation of Wastewater Generation in Kathmandu Valley Urban Region, 2001

Municipality	Population (2001)	Million liters/day
Bhaktapur	72,543	3.7
Kathmandu	671,846	34.3
Kirtipur	40,835	2.1
Lalitpur	162,991	8.3
MadhyapurThimi	47,751	2.4
Total	**995,996**	**50.8**

Source: CBS 2001, NWSC 2001.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Assessment of Impacts

109. **Determination of Area of Influence.** The primary impact areas are (i) alignment of pipes for BDS and DNI and sites of the reservoirs and WTP; (ii) main routes/intersections which will be traversed by construction vehicles; and (ii) quarries and borrow pits as sources of construction materials. Table 14 provides the details of direct and indirect impact zones.

Table 14: Area of Influence of Each Component

Component	Package No.	Description	Details	Direct and Indirect Impact Zones
BDS 2	KUKL/BDS-SR/02 (Package-2)	Construction of main pipelines for bulk water distribution system Ring Main and Service reservoir	Length of Pipe = 24.85 km Diameter (dia) of Pipe – 400 to 1100 mm dia. Ductile Iron Pipe Nos of RVT – 2 Nos Total Capacity – 17,000 cu.m.	Direct impact zone: (i) pipes alignment; (ii) during construction, maximum of 0.5 meters each side for trenches during pipe laying; vehicle and workers routes; adjacent water bodies, if any; labor camps, if required; storage and disposal sites; sources of materials; locations of sensitive receptors (schools, hospitals, silent zones, etc.); (iii) during operation, Kathmandu Valley for improved water supply. Indirect impact zone: (i) during construction, 50 m on either side of road through which alignment is passing; (ii) during operations and maintenance/repair works, surrounding areas adjacent to work areas

Component	Package No.	Description	Details	Direct and Indirect Impact Zones
BDS 4	KUKL/BDS-SR/04 (Package-4)		Length of Pipe = 8.06 kms Dia of Pipe – 400 to 700 mm dia. Ductile Iron Pipe Nos of RVT – 3 Nos Total Capacity – 15000 cu.m.	Direct impact zone: (i) pipes alignment; (ii) during construction, maximum of 0.5 meters each side for trenches during pipe laying; forest area; vehicle and workers routes; adjacent water bodies, if any; labor camps, if required; storage and disposal sites; sources of materials; locations of sensitive receptors (schools, hospitals, silent zones, etc.); (iii) during operation, Kathmandu Valley for improved water supply. Indirect impact zone: (i) during construction, 50 m on either side of road through which alignment is passing; (ii) during operations and maintenance/repair works, surrounding areas adjacent to work areas
DNI 7		replace existing, dilapidated network	Length of Pipe – 210 kms Pipe Size DI – 100 to 600 mm diameter Pipe Size PE – 50 to 100 mm diameter	Direct impact zone: (i) pipes alignment; (ii) during construction, maximum of 0.25 meters each side for trenches during pipe laying; vehicle and workers routes; adjacent water bodies, if any; labor camps, if required; storage and disposal sites; sources of materials; locations of sensitive receptors (schools, hospitals, silent zones, etc.); (iii) during operation, Kathmandu Valley for improved water supply. Indirect impact zone: (i) during construction, 10 m on either side of road through which alignment is passing; (ii) during operations and maintenance/repair works, surrounding areas adjacent to work areas
DNI 8			Length of Pipe – 82kms Pipe Size DI – 100 to 500 mm diameter Pipe Size PE – 50 to 100 mm diameter	Direct impact zone: (i) pipes alignment; (ii) during construction, maximum of 0.25 meters each side for trenches during pipe

Component	Package No.	Description	Details	Direct and Indirect Impact Zones
				laying; physical and cultural resources; vehicle and workers routes; adjacent water bodies, if any; labor camps, if required; storage and disposal sites; sources of materials; locations of sensitive receptors (schools, hospitals, silent zones, etc.); (iii) during operation, Kathmandu Valley for improved water supply. Indirect impact zone: (i) during construction, 10 m on either side of road through which alignment is passing; (ii) during operations and maintenance/repair works, surrounding areas adjacent to work areas
WTP expansion		double the current capacity of the Sundarijal WTP to 170 MLD	Construction of WTP to treat 85 MLD water with all required necessary units. Required water from Tilrace channel of the Melamchi diversion scheme (MDS) at Sundarijal shall be received by the WTP at Sundarijal. A conventional gravity WTP is proposed to treat raw water to World Health Organization (WHO) drinking water standards. The major components of the WTP are: (i) cascade weirs for aeration, (ii) rectangular sedimention tanks, (iii) rectangular sedimentation tanks, (iv) rectangular open filters with backwash facilities, (v) treated water storage reservoirs, (vi) sludge lagoons, (vii) chemical building, and (viii) an administrative building. For the treatment of raw water, chemical aids such as alum, lime, chlorine, polyelectrolytes etc. are proposed for use	Direct impact zone: (i) during construction, WTP area; vehicle and workers routes; adjacent water bodies, if any; labor camps, if required; storage and disposal sites; sources of materials; sensitive receptors (schools, hospitals, silent zones, etc.) adjacent to the WTP area, if any; (iii) during operation, Kathmandu Valley for improved water supply. Indirect impact zone: (i) during construction. minimal as area has existing WTP, demarcated, and activities will be within area with boundary walls; (ii) during operation, minimal as enough space is available within the WTP compound for management of generated wastes (sludge, containers, etc.)

Component	Package No.	Description	Details	Direct and Indirect Impact Zones
			for coagulation and disinfecting.	

110. The ADB REA Checklist for Water Supply was used to screen the project for environmental impacts and to determine the scope of the IEE. The completed checklist is provided in Appendix 1. Results of the rapid assessment show components are located in developed areas within Kathmandu Valley or in its immediate surroundings which were converted into urban use for many years ago. Except for the existing pipes to be replaced in the Shivapuri Nagarjun National Park, there are no eco-sensitive sites (wetlands, mangroves, or estuaries) in or near the project locations. Package DNI 8 involves laying of pipes near protected physical and cultural resources, however alignments will be designed as far as possible from the core area. PID will consult and discuss with Department of Archaeology and interest groups such as UNESCO during finalization of design to ensure conditions and provisions are incorporated into the project.

111. Baseline photographs and conditions of the sites as per preliminary design have been documented during preparation of this IEE. PID is required to update the information during detailed design phase and submit an updated IEE to ADB for review and approval.

B. Pre-construction Phase

112. **Consents, permits, clearances, no objection certificates (NOCs).** Failure to obtain necessary consents, permits, NOCs can result in design revisions and/or stoppage of works. The project must obtain no-objection letters and agreements for

(i) temporary easements to land and properties;
(ii) construction in Darbar and Patan Squares and other heritage areas as necessary from the Department of Archaeology, as well as conducting Archaeological Impact Assessments or other procedures approved by DOA, if required;
(iii) digging of roads from the Department of Roads, Lalitpur submetropolis and Kathmandu metropolis; and
(iv) construction and cutting of trees in Balaju (if unavoidable, as works will be within the existing access road) from the Shivapuri Nagarjun National Park and Department of Forest.

113. **Mitigation measures.** The following will be conducted during detailed design phase:

(i) Obtain all necessary consents, permits, clearance, NOCs, prior to start of civil works;
(ii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs;and
(iii) Include in detailed design drawings and documents all conditions and provisions if necessary.

114. **Securing the project sites.** During the preparation phase, the land areas required by the project should be demarcated or pegged. Notify affected sensitive receptors by providing sign boards, and/or any other form/information they can understand, about the nature and duration of construction works and contact numbers for concerns/complaints.

115. **Erosion.** Most of the impacts will occur due to excavation and earth movements during construction phase. Prior to commencement of civil works, the contractor will be required to:

(i) Develop an erosion control and re-vegetation plan to minimize soil loss and reduce sedimentation to protect water quality;
(ii) Minimize the potential for erosion by balancing cuts and fills to the extent feasible;
(iii) Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure); and
(iv) Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize vegetation removal. Stage construction to limit the exposed area at any one time.

116. **Utilities and Service Interruption.** The most noticeable effect will be the potential interruption of services and utilities to residents and businesses in the project area. These interruptions will be scheduled and intermittently related to localized construction activities. Telephone lines, electric poles and wires, water and sewer lines within road RoW may be damaged if these are falling in the alignment of the BDS and DNI. To mitigate the adverse impacts due to relocation of the utilities, the contractor will:

(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase;
(ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services;
(iii) Obtain from PID the list of affected utilities and operators and coordinate closely with relevant government departments; and
(iv) If relocations are necessary, coordinate with the providers to relocate the utility.

117. **Water Supply Service Interruption.** A different but no less significant impact is the effect on people and communities if water supplies are closed down for extended periods when work is conducted on the network. This would be inconvenient in the short term, and there could be health risks if the water supply was unavailable for several successive days or longer. It will therefore be important to take the necessary measures to avoid such a situation. This will require the contractor, with guidance from PID, to:

(i) Plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration);
(ii) Provide alternative potable water to affected households and businesses for the duration of the shut-down; and
(iii) Liaise with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.

118. **Impacts on Physical Cultural Resources.** There is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in and around existing RoW and specified government, so no risk is foreseen to these structures. However pipelaying for DNI 8 packages will occur within or near protected physical and cultural resources (UNESCO World Heritage Sites). PID will:

(i) Consult Department of Archaeology to obtain an expert assessment of the archaeological potential of the pipe alignments;
(ii) Consider alternatives if the site is found to be of medium or high risk;
(iii) Include interest groups (e.g., UNESCO, NGOs, etc) in consultation forums as project stakeholders so that their expertise can be made available; and

(iv) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.

119. **Sites for construction work camps and areas for stockpile, storage and disposal.** The priority is to locate these near the project area. The contractor will be required to meet the following criteria for the sites:

(i) Will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems, etc.;
(ii) Residential areas will not be considered so as to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime);
(iii) Disposal will not be allowed near sensitive areas or areas which will inconvenience the community; and
(iv) The construction camp, storage of fuel and lubricants should be avoided at the river bank. The construction camp site/s, including amenities for the workers, should be finalized in consultation with PID.

120. Impacts on **Sources of construction materials.** Approximately 1,200 m^3 of sand, 2,500 m^3 of stone chips and 300 MT of cement are expected to be required for the project[2]. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. The contractor will be required to:

(i) Use quarry sites and sources permitted by government;
(ii) Verify suitability of all material sources and obtain approval from PID;
(iii) If additional quarries are required after construction has started, obtain written approval from PID; and
(iv) Submit to PID on a monthly basis documentation of sources of materials.

121. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of PID and other relevant authorities, as required.

122. **Impacts on Access.** Hauling of construction materials and operation of equipment on-site can cause traffic problems and conflicts in RoW along pipe alignments. The amount of construction truck traffic near BDS alignment and WTP site will be substantial due to the amount of earthwork. Construction traffic will access most work areas from the existing roads/highways therefore potential impacts will be of short-duration, localized and can be mitigated. The contractor will be required to prepare a traffic management plan to include the following mitigation measures:

(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(ii) Schedule transport and hauling activities during non-peak hours;
(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
(iv) Keep the site free from all unnecessary obstructions;
(v) Drive vehicles in a considerate manner;
(vi) Coordinate with the Kathmandu Metropolitan Traffic Police Division for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;

[2] This will be updated by the contractor after detailed design, which will be verified by PID.

(vii) Notify affected sensitive receptors by providing sign boards with information about the nature and duration of construction works and contact numbers for concerns/complaints; and
(viii) Provide access to affected households (walkways, metal sheet, planks, etc.) along across trenches for pipelaying during the construction phase.

123. Impacts on **Social Resources.** Core labor standards need to be complied with. Minors should not be allowed to work at any time. Wages should be settled by the District Wage Evaluation Committee (DWEC), with the list of employees finalized and equal pay given to men and women.

124. Prior to start of civil works, the contractor is required to (i) attend a safeguards orientation program; and (ii) submit to PID for review and approval, the EMEP together with the pre-construction required plans.

C. Construction Phase

a. Construction Method

125. Pipes for the BDS and DNI will primarily be buried in trenches adjacent to roads' un-used ROWs. In some areas occupied by drains or edges of shops and houses, trenches may be dug into the edge of the road to avoid damage to utilities and properties. Excavation works will be conducted in phase manner. Method and schedule will be approved by PID to ensure minimal disturbance to people and business during construction phase.

126. DNI pipe laying works will be approximately 1-4 days, and for BDS, 5-7 days. Trench sections for DNI works will be 100-200 m in length, and 50-100 m for BDS. The construction will involve digging of trenches for pipe laying using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using a small rig for the larger pipes. Pipes will be joined by hand, after which sand from local quarries will be shovelled into the trench beneath and around the pipe for support and protection. Soil will then be replaced manually on top of the pipe and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

127. Pipes are normally covered by 1.0 m of soil, and a clearance of 100 mm is left between the pipe and each side of the trench to allow backfilling. Wherever it is to be laid over ground necessary support and clamping arrangement will be provided. During the construction there will be piling of excavated earth from the trench. There will be storage of sand also as this has be put after laying pipes for support. Tasks to be performed for the pipe laying works are listed in the order of priority as:

(i) obtain excavation permits;
(ii) arrange road closure, finalize detours, inform traffic police, and inform public transport agencies and affected road users;
(iii) inform PID and other relevant users of required water supply interruptions;
(iv) excavate trial pits and identify existing utilities;
(v) set out pipe routes, prepare shop drawings, and obtain PID approval;
(vi) identify bad soil areas to ascertain backfill material requirement;
(vii) identify borrow pits;

(viii) identify disposal sites for excess and unsuitable excavated materials;
(ix) transport pipes to nearby locations;
(x) implement road detours;
(xi) excavate trenches, lay pipes, provide anchor blocks, backfill trenches, and construct chambers, and provide special bedding where specified;
(xii) carry out pressure test;
(xiii) flush and disinfect;
(xiv) reinstate road; and
(xv) operate.

128. Construction of the WTP and reservoirs will be straight-forward and not require special construction method. Foundations will be dug and aggregate and concrete poured in to create the floors, after which the brick walls and roof materials will be added by hand. Materials and other equipment (including flow-meters) will be brought in on trucks thus no special heavy equipment is required.

b. Potential Impacts and Mitigation Measures

129. **Soil erosion and slope instability due to excavation.** Impacts likely to occur from the improvement and construction of the water distribution systems will include:

(i) trench excavations (with extra sensitivity in heritage areas);
(ii) topsoil stripping, which may induce soil erosion, and slope instability; and
(iii) Haphazard disposal of spoil materials may create erosion problems, disturbances to the existing drainage lines, changes in the existing land use practices, and traffic, causing public disturbance and protest.

130. The impacts are not significant, site specific, minimal, limited duration, and mitigation measure can be readily designed. Mitigating measures to be used are:

(i) separate stockpiles of topsoil in a safe yard for further use;
(ii) dispose spoils at designated and stabilized sites;
(iii) compact backfill of excavated areas, including replacement of topsoil;
(iv) avoid work during the rainy season as much as possible; mulching to stabilize exposed areas;
(v) use bioengineering techniques (e.g. revegetating areas promptly);
(vi) provide channels and ditches for post-construction flows;
(vii) line of steep channels and slopes (e.g. use of jute matting); and
(viii) prevent off-site sediment transport using settlement ponds, silt fences, and quick backfilling. To encourage quick backfilling, short sections should be planned to complete works within 1-2 days, which will limit the time of disturbance to the community.

131. **Impacts on surface water quality.** Excavation and laying of pipelines at river crossings could have adverse impacts on river water quality and the aquatic ecosystem. The impacts are not significant, site specific, minimal, limited duration, and mitigation measure can be readily designed. Mitigation measures include:

(i) limit construction to the dry season only;
(ii) use river diversions with bunds;
(iii) remove excavated materials immediately
(iv) do not allow stockpiling of materials near water bodies
(v) check on a daily basis, any construction related materials that may have fallen into water bodies and remove immediately

132. Deep excavations can intercept and interfere with the localized groundwater, thereby affecting flows from irrigation canals, springs, and wells, and causing water shortages. The impacts are not significant, site specific, minimal, limited duration, and mitigation measure can be readily designed. Mitigation measures include:

(i) bund local wells and springs and irrigation canals from temporary spoil dumps;
(ii) monitor local wells and spring-fed spouts or *kuwas*, particularly downhill of excavations, plus temporary supply provided if flow is affected;
(iii) require permeable base and side backfill at deep excavated sites; and
(iv) provide alternate source of drinking water at affected location.

133. **Change in river hydrology and morphology.** The construction, rehabilitation, and operation of water distribution networks could have impacts on the river hydrology and morphology due to quarrying from riverbeds for sand and gravel, particularly during the dry season. Quarrying and mining activities in rivers and streams for extraction of construction materials shall not be carried out so as not to change the river cross-sections and longitudinal profiles, and should be carried out only from approved sources. Thus impacts are not significant.

134. **Water and land pollution.** Dumping of construction-related wastes (solid wastes, workers' toilet, etc) into land and adjacent bodies of water can cause pollution. This impact is avoidable by the following measures:

(i) avoid putting up construction labor camps and facilities within the drainage area or adjacent to water bodies;
(ii) prepare and implement a waste management plan. Manage solid waste according to the following hierarchy: reuse, recycling and disposal. Include in waste management plan designated/approved disposal areas.
(i) coordinate with PID for beneficial uses of excavated soils/silts/sediments or immediately dispose to designated areas.
(ii) recover used oil and lubricants and reuse; or remove from the sites.
(iii) avoid stockpiling and remove immediately all excavated soils, excess construction materials, and solid waste (removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items).
(iv) provide designated areas with collection of bins for wastes;
(iv) provide toilet facilities and prohibit open defecation; and
(v) prohibit washing of vehicles next to rivers and streams.
(vii) provide training to the workforce on managing wastes (reduce, reuse, recycle) and occupational health and safety (OHS) measures during construction

135. **Impacts on air quality and increase in levels of noise and vibrations.** Earth excavation, construction materials and stockpiling, aggregate crushing, drilling, quarrying, and plying of vehicles will produce dust (total suspended particulates, PM_{10}), hydrocarbons (carbon monoxide, carbon dioxide, methane),sulphur dioxide, nitrous oxide, hydrogen sulfide, noise, and vibrations. Trucks plying non-metallic roads will produce huge amounts of dust, thereby reducing air quality and increasing noise levels to above 90 dB affecting people's health. The impacts are not significant, site specific, minimal, limited duration, and mitigation measure can be readily designed. Mitigation measures include:

(i) conduct dust suppression on roads or at open sites by sprinkling water as required at regular intervals;
(ii) cover earth stockpiles using plastic sheets or cement jute bags;

(iii) monitor dust (TSP, PM_{10}), sound, and vibrations at regular intervals (Appendix 4 gives the national ambient air quality standards for Nepal and Appendix 5 gives the recommended standards for vibration from construction sites.);
(iv) limit vehicle speeds and banning power horns;
(v) ensure vehicles comply with the National Vehicle Mass Emission Standards, 2056 BS;
(vi) fit vehicles with mufflers to control noise;
(vii) maintain vehicles regularly;
(viii) prohibit operation of crushing plants and construction vehicles between 7 p.m. and 6 a.m. in residential areas
(ix) prohibit heavy equipment and machineries in protected physical and cultural resources
(x) compensate damages to buildings and other properties caused by vibrations

136. **Impacts on biological environment.** Although most of the construction and improvement works will take place in urban and developed areas, there will be some impacts on the ecological resources (loss of trees and vegetation, loss of wildlife and endangered species, disruption of protected areas, damage to fisheries and riverbed aquatic ecology) due to (i) vegetation clearance and loss of species due to construction of project structures; (ii) fuel wood and non-timber forest products (NTFP) collection by the workforce and vegetation clearance for construction activities; and (iii) construction activities at pipeline crossings over riverbeds. The impacts are not significant, site specific, minimal, limited duration, and mitigation measure can be readily designed. Mitigation measures include:

(i) avoid tree cutting, and if unavoidable, cut only trees that are marked and have been approved by the Shivapuri Nagarjun National Park/Department of Forestry for removal, and planting and rearing tree saplings at the rate of 25 saplings for each felled tree;
(ii) prohibit use of fuel-wood and timber collection;
(iii) prohibit hunting and the illegal collection of protected animals and plants;
(iv) provide cooking facilities to the workforce;
(v) compensate private trees and community forests affected;
(vi) for works near water bodies and river crossings, limit activities during dry season only, carry out bunding off of active sections, and temporarily divert water course.

137. **Impacts on physical cultural resources.** As per preliminary design, there are no structures, encroachers or utilities to be shifted along ROWs during pipe laying works. There is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in and around existing RoW and specified government land, so no risk is foreseen to these structures. However pipelaying for DNI 8 packages will occur within or near protected physical and cultural resources (UNESCO World Heritage Sites). This will be reassessed during detailed design phase. The impacts are site-specific, short-term and can be mitigated. The contractor will be required to:

(i) Confirm with PID the archaeological potential of the pipe alignments.
(ii) Consider alternatives if the site is found to be of medium or high risk.
(iii) Follow PID's protocol in conducting any excavation work
(iv) Ensure no damage to structures/properties near construction zone.
(v) Implement good housekeeping. Remove wastes immediately. Prohibit stockpiling of materials that may obstruct/slow down pedestrians and/or vehicle movement.
(vi) Ensure workers will not use nearby/adjacent areas as toilet facility.

(vii) Provide instructions to workers on event of chance finds for archaeological resources. Works must be stopped immediately until such time chance finds are cleared by experts.

(viii) If a worker finds any archaeological object in his area, contractor is required to fill the description of such object in the form (Appendix 7). Immediately send the accomplished form together with photographs of such project to PID who will contact the Chief District Officer immediately. PID will submit the findings in writing to the Department of Archaeology within 35 days as per Ancient Monuments Protection Act, 1956, and Rules, 1989.

(ix) Photograph all sites within the heritage area to enable before and after comparison

(x) Reinstate all roads to original character, especially in heritage areas.

(xi) Avoid disturbance to any historic or heritage buildings or structures by taking necessary precautions (working away from heritage buildings, hand digging, no heavy equipment, and others); and

(xii) for pipe-laying works in roadways within UNESCO heritage areas (e.g., Patan Square and Darbar Square), ensure the following measures: (a) no vibrating machinery near heritage buildings; (b) only hand digging allowed; (c) informing the community prior to daily construction of sections; (d) ensuring no blockage to tourist areas; (e) having clear signage related to KUKL works; (f) ensuring reinstatement of roads to original condition;, (g) ensuring extra measures (fencing and/or barriers) to protect tourists and public from construction site, and (h) ensuring that a construction supervisor is onsite at all times

138. **Increase in traffic and impacts on accessibility and socio-economic activities.** As per preliminary design, closure of roads are not required for pipe laying works however, may impede access of residents and customers to shops along trenches. There may be increased vehicle movements during delivery of construction materials, transport of workers, and disposal of excess excavated soil. There may also be inconvenience to road users due to slower flow of traffic in areas with narrow roads and reduced usable portions of the road carriageway. The potential impacts are negative and moderate but short-term, temporary and can be mitigated. The contractor will be required to:

(i) avoid full street closure to extent possible, and limit number of full closure days where unavoidable;

(ii) hold community meetings prior to construction to ensure awareness;

(iii) provide walkways and metal sheets where required to maintain access of people and vehicles

(iv) provide sign boards and/or other form/language affected people can understand to inform them of the nature and duration of construction works and contact numbers for concerns/complaints

(v) increase the workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools

(vi) develop a traffic management plan and coordinate with PID on transportation routes and schedule (Appendix 6 provides basic principles and strategies for managing traffic)

(vii) schedule transport and hauling activities during non-peak hours. communicate road detours via visible boards, advertising, pamphlets, etc

(viii) ensure heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites

(ix) ensure that there are barriers in populated residential, business, or tourist areas to ensure that the public is not allowed near work site

(x) avoid involuntary displacement
(xi) ensure trenches are open only 1-3 days in areas of businesses activity;
(xii) if income loss occurs, compensate impacts and rehabilitate according to agreed resettlement plan (RP);
(xiii) compensate for any loss of crops, trees, and other natural resources according to agreed RP;
(xiv) make arrangements for a grievance redress committee to look into the grievances;
(xv) restoring temporary sites to their natural or stable conditions as per agreements with the land owners;
(xvi) make sure that the proponent reports in writing that temporary areas have been vacated and restored to pre-project conditions before acceptance of the works;
(xvii) provide employment opportunities to the affected people;
(xviii) provide all possible assistance to the displaced people until they are settled;
(xix) provide disturbance and rehabilitation costs;
(xx) compensate for damages caused by construction-related vibrations

139. **Impacts on occupational health and safety.** Workers need to be mindful of occupational hazards which can arise from excavation works in high-traffic and busy areas. Exposure to work-related chemical, physical, biological and social hazard is typically intermittent and of short duration, but is likely to reoccur. Potential impacts are negative and long-term but reversible by mitigation measures. Overall, the contractor should comply with IFC EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES). The contractor will be required to:

(i) Avoid worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
(ii) Develop comprehensive site-specific health and safety (H&S) plan as part of EMEP. The overall objective is to provide guidance to contractors on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project.
(iii) Include in H&S plan measures such as: (i) type of hazards during excavation works; (ii) corresponding personal protective equipment for each identified hazard; (iii) H&S training for all site personnel; (iv) procedures to be followed for all site activities; and (v) documentation of work-related accidents.
(iv) Provide compulsory H&S orientation training to all new workers to ensure that they are apprised of the rules of work at the site, personal protective protection, and preventing injury to fellow workers.
(v) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site as well as at construction camps.
(vi) Provide medical insurance coverage for workers.
(vii) Secure construction zone from unauthorized intrusion and accident risks.
(viii) Provide supplies of potable drinking water.
(ix) Provide clean eating areas where workers are not exposed to hazardous or noxious substances.
(x) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted.

(xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas.
(xii) Ensure moving equipment is outfitted with audible back-up alarms.
(xiii) Mark and provide sign boards in the construction zone, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.
(xiv) provide regular health checkups, proper sanitation and hygiene, health care, and control of epidemic diseases to the workforce;
(xv) launch awareness programs concerning human trafficking and the possibility of spread of STDs and HIV/AIDS using brochures, posters, and signboards;

140. **Impacts on socio-economic activities.** Manpower is expected to be required during the 36 months of construction phase. This can help generate contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The contractor will need to adopt the following mitigation measures:

(i) employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available.
(ii) Provide equal opportunity and pay to women.

141. Therefore, during the construction phase, impacts mainly arise from (i) disturbance of residents, businesses, and traffic; (ii) need to manage excess construction materials and spoils; and (iii) community and workers health and safety. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during excavation works on busy roads.

D. Post-Construction Phase

142. Site clean-up is necessary after construction activities. The contractor will be required to:

(i) Backfill any excavation and trenches, preferably with excess excavation material generated during the construction phase.
(ii) Restore the contours of the river bed and banks immediately, if disturbed during construction works
(iii) Use removed topsoil to reclaim disturbed areas.
(iv) Stabilize all areas of disturbed vegetation using weed-free native shrubs, grasses, and trees.
(v) Restore access roads, staging areas, and temporary work areas.
(vi) Restore roadside vegetation.
(vii) Remove all tools, equipment, barricades, signs, surplus materials, debris, and rubbish. Demolish buildings/structures not required for O&M. Dispose in designated disposal sites.
(viii) Monitor success of re-vegetation and tree re-planting. Replace all plants determined to be in an unhealthy condition.
(ix) Request in writing from PID that construction zones have been restored.

E. Operational Phase

143. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. During operations phase, the facilities will need to be repaired from time to time, but environmental impacts will be much less than

those of the construction period as the work will be infrequent, affecting small areas only. The main impact is increased generation of wastewater. KVWMP will improve the existing wastewater collection and treatment systems by rehabilitating existing sewage treatment plants and expanding the sewerage network, as well as providing a septage treatment facility. All wastewater effluents must meet government treatment standards. Sludge disposal from the sewage treatment plant is addressed in KVWMP EMP.

The operation of the WTP will be monitored through the SCADA system. Continuous online monitoring of the parameters would be ensured with necessary triggers of alarms and messages to the supervisors, escalating protocols to senior operational managers and generating periodical reports. Potential impacts due to operations and maintenance (O&M) of WTP is due to sludge cake generated from the clarifloculator which is comprise of dissolved solids and lime alum and presetting muddy water which will have suspended solids and other impurities . As per preliminary design, an estimate of 1 MT of dried sludge will be produced every 5 years. Analysis of sludge cake from similar processes reveals that it is likely to be neutral. During operations, once cake is formed it will be analyzed for the composition to rule out any heavy metal contamination. The presetting muddy will be collected in a tank and clear water from tank will reutilized.

144. Chlorine will be used as disinfectant and stored in chlorine cylinders (1 MT capacity). Since chlorine is classified as hazardous substance therefore its storage will be as per provisions of EPR, 1997. A small pit will also be constructed near the cylinder storage area for neutralization of chlorine in case there is some accidental release of chlorine due to faulty valve of cylinder, etc. This pit will have active lime solution for the neutralization. Other materials such as lime and alum are not classified as hazardous and these will be stored in the storage building in plastic bags.

145. The O&M contractor will be required to:

(i) Prepare a sludge disposal plan and include it in the O&M manuals.
(ii) Conduct analysis of sludge cake prior to disposal
(iii) Conduct analysis of physical and chemical quality of pre-settling water which will not be re-utilized prior to discharge.
(iv) Prepare chemical spills response plan.
(v) Closely observe flow rate, head loss, turbidity levels for each filter, backwashing and air scouring cycles to provide operator with an evaluation of the filter's condition and will indicate the need for corrective action, inspection or other actions.

VI. POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

146. Possible environmental measures that shall be carried out by KUKL before the project commences are:

(i) training and awareness programs in health and sanitation, OHS, community health and safety, and usage of water and its importance (water cost, savings, reuse, recycle, water pollution) for the general public; and
(ii) community meetings prior to any construction works to make public aware of temporary disturbances during construction.

147. Sufficient human resources should be invested in maintaining drinking water systems. The efficiency of the treatment plants should be well recorded by regularly monitoring the water characteristics. There are many environmental youth clubs in the Kathmandu Valley. They can be mobilized to monitor water quality and report problems to KUKL.

148. **Transboundary and Cumulative Impacts**: There will be no environmental transboundary and cumulative impacts, such as air pollution, abstraction of water, loss of habitat, or pollution of international waterways. Environmental and socioeconomic impacts have already been mentioned earlier. The project will help create employment opportunities and enhance the local labor skills in pipe laying for future works in Nepal.

VII. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

149. The ADB SPS requires meaningful stakeholder consultations. Public consultations were held throughout the entire process of the EIA study for MWSP and the preparation of project and related safeguard documents. Several consultations were held in the Kathmandu Valley, in different wards and with different heterogeneous groups. The project objectives were explained, and people were asked for their opinions and suggestions. In addition, MWSP disseminated project information through different media (print and electronic media, interaction forums, and newsletters, both in Nepali and English since 2001. The public was informed from time to time about the construction of reservoirs, water transmission lines water treatment plants, and land acquisition together, with the project's resettlement, rehabilitation and compensation modalities. MWSP formed an NGO committee comprised of donors, MWSDB, and NGOs, which held monthly meetings in Kathmandu. Similarly, the MWSP staff attended regular discussion forums organized by NGOs, such as the Sunday Forum of WAFED, the discussion forums held by the NGO for Urban Water and Sanitation, Nepal Vasa Misha Khala, Society of Business and Professional Women, Society of Public Health Engineers-Nepal, Nepal Engineering Council, Nepal Engineering Association, and Melamchi Concern Group, various FM radio programs, and others

150. Several meetings, workshops, and FGDs (Table 15) were held with stakeholders, during the preparation of KVWSIP. Consultations were made with the Department of Archaeology and UNESCO office in Kathmandu, who advised the statutory requirements applicable to the project to be obtained prior to start of civil works. Consultations were also held with the Assistant Warden of Shivapuri Nagarjun National Park for the rehabilitation of the existing 80-year-old reservoir and the laying of an 800 mm-diameter pipe (as part of package BDS 4), who advised the procedure for obtaining the permission.

Table 15: Meetings, Workshops, Consultations, and Focus Group Discussions Held

S N.	Date	Topic
1	8 July 2009	Inception consultative workshop
2	17 July 2009	Focus group discussion on wastewater management in Kathmandu Valley
3	23 July 2009	Focus group discussion on population projections and water demand
4	14 August 2009	Focus group discussion on asset condition survey and water supply zoning
5	30 August 2009	Steering Committee meeting
6	16 September 2009	Focus group discussion on conceptual wastewater master plan options
7	22 October 2009	Focus group discussion on selected DNI pilot area
8	29 October 2009	Focus group discussion on draft CIAMP
9	5 November 2009	Meeting on CIAMP
10	13 January 2010	Presentation and discussion meeting on PPTA progress, draft CIAMP, and interim feasibility reports
11	13 January 2010	Focus group discussion on wastewater
12	1 March, 5 March 2010 17 March 2010	Consultations with UNESCO staff Mr. Tap Raj Panta and Ms. Nipuna Shrestha Consultation with Mr. Bhim Prasad Nepal, Chief, National Archives, Department of Archaeology
13	8 March 2010	Consultation with warden, Mr. Manoj Kumar Shah, ShivapuriNagarjun National Park
14	21 April 2010	KUKL consultative workshop on the project loan feasibility study
15	16 March 2011	Mr. Axel Plathe, Head of Office and UNESCO Representative to Nepal, UNESCO
16	18 March 2011	Meeting with Mr. Bishnu Raj Karki, Director General, Department of Archaeology
17	21 March 2011	Meeting with Mr. PurushottamGhimire, Joint Secretary, Chief of Environmental Division, Ministry of Environment
18	22 March 2011	Mr. K.P Archarya, Director General, Department of National Parks and Wildlife

CIAMP = Capital Investment and Asset Management Program, DNI = Distribution Network Improvement, KUKL = Kathmandu Upatyaka Khanepani Limited, PPTA = Project Preparatory Technical Assistance, UNESCO = United Nations Educational, Scientific, and Cultural Organization.

151. A community awareness participation plan was prepared under on-going KVWSIP (ADB Loan 2776) and community awareness consultants have been recruited. PID will extend the plan and expand the consultation and disclosure process to cover components under the additional financing. This will be coordinated with the community awareness consultants, DSC, and contractors to ensure that communities are made fully aware of project activities in all stages of implementation.

152. All safeguards documents were endorsed by the executing agency and ADB will upload all documents on their own website. The full IEE reports are available to interested parties upon request from PID. Translated versions of the IEE were also made available and disclosed in public locations.

VIII. GRIEVANCE REDRESS MECHANISM

153. A grievance redress mechanism (GRM) has been established in KVWSIP to receive, evaluate, and facilitate the resolution of affected people's concerns, complaints, and grievances about the social and environmental performance of the project. The same GRM will be used for the additional financing and is outlined below. It consists of three levels with time-bound schedules and specific persons to address grievances.

154. **First level of GRM:** The first level and most accessible and immediate contact for the fastest resolution of grievances are the contractors and supervision consultants on site. Prior to construction of any works, the community awareness consultants, DSC, and contractors are to hold local community meetings to notify the local residents and businesses of the temporary disturbance, and to inform them of the project. If a local area committee (LAC) exists, they should also be informed. If any complaints arise, the contractors, DSC, and PID can immediately resolve the complaint on site. The PID branch offices can also be involved in grievance redress at this stage. The KUKL hotline and PID office phone number will be posted in public areas within the project area and construction sites. Any person with a grievance related to the project can contact the project to file a complaint. The PID branch offices are staffed with a consumer relations officer to field and resolve complaints. The consumer relations officer or branch manager will document the complaint, and immediately address and resolve the issue with the contractor within 1-2 days, if the complaint remains unresolved at the field level. The branch manager may seek the assistance of the DSC safeguards specialists (the environmental specialist or social safeguards specialist) to help resolve the issue. The consumer relations officer or branch manager will notify the PID safeguards unit that a complaint was received, and whether it was resolved. The branch manager will fully document the following information:

(i) name of the person;
(ii) date complaint was received;
(iii) nature of complaint;
(iv) location; and
(v) how the complaint was resolved.

155. **Second level of GRM:** Should the grievance remained unresolved, the branch manager will forward the complaint to the PID safeguards unit. The person filing the grievance will be notified by the consumer relations officer or branch Manager that the grievance was forwarded to the PID safeguards unit. For resettlement issues, the resettlement officer will address the grievance; for environmental issues, it will be the environmental officer. Grievances will be resolved through continuous interactions with affected persons, and the PID will answer queries and resolve grievances regarding various issues, including environmental, social, or livelihood impacts. Corrective measures will be undertaken at the field level by the PID safeguards staff within 7 days. The relevant safeguards unit staff will fully document the following information:

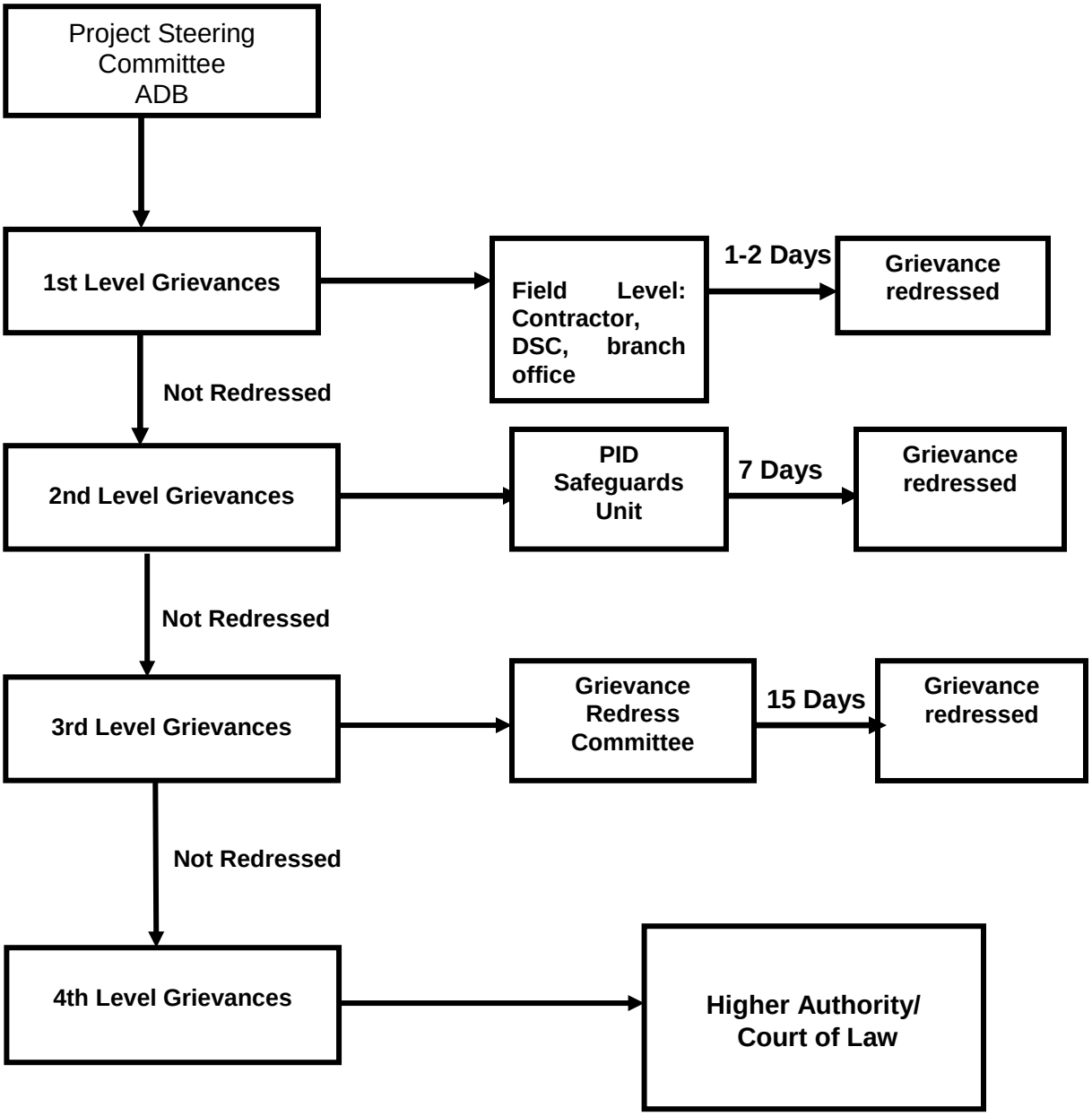
(i) name of the person;
(ii) date complaint was received;
(iii) nature of complaint;
(iv) location; and
(v) how the complaint was resolved.

156. **Third level of GRM:** Should the grievance remain unresolved, the PID's project director will activate the third level of the GRM by referring the issue (with written documentation) to the local Grievance Redress Committee (GRC) of the KUKL, who will, based on review of the grievances, address them in consultation with the PID safeguards unit, project director, and affected persons. The local GRC will consist of members of the PID, affected persons, and local area committee, among others determined to provide impartial, balanced views on any issues. The GRC should consist of around five persons. A hearing will be called with the GRC, if necessary, where the affected person can present his or her concern/issues. The process will promote conflict resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 15 days. The

functions of the local GRC are as follows: (i) to provide support to affected persons on problems arising from environmental or social disruption, asset acquisition (if necessary), and eligibility for entitlements, compensation, and assistance; (ii) to record grievances of affected persons, categorize and prioritize them, and provide solutions within 15 days; and (iii) to report to the aggrieved parties developments regarding their grievances and decisions of the GRC. The PID safeguards officers will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings, and taking follow-up action to see that formal orders are issued and the decisions carried out.

157. **Fourth level of GRM:** In the event that a grievance is not addressed by the contractor, DSC, branch office, PID, or GRC, the affected person can seek legal redress of the grievance in the appropriate courts, the fourth level of the GRM, which is the formal legal court system. The grievance redress mechanism and procedure is depicted in **Figure 3**.

Figure 2: Grievance Redress Mechanism (GRM)



DSC= design and supervision consultant, PID=project implementation directorate.

IX. ENVIRONMENT MANAGEMENT PLAN

158. The basic objectives of the EMP are as follows:

(i) to ensure that all mitigation measures and monitoring requirements will actually be carried out at different stages of project implementation and operation—pre-construction, construction and operation, and maintenance;
(ii) to recommend a plan of action and a means of testing the plan to meet existing and projected environmental problems;
(iii) to establish the roles and responsibilities of all parties involved in the project's environmental management;
(iv) to describe mitigation measures that shall be implemented to avoid or mitigate adverse environmental impacts and maximize the positive ones;
(v) to ensure implementation of recommended actions aimed at environmental management and its enhancement; and
(vi) to ensure that the environment and its surrounding areas are protected and developed to meet the needs of the local people and other stakeholders and safeguard the interests of the common people.

159. This EMP will be included in the bid documents and will be further reviewed and updated during implementation based on detailed designs, conditions of clearances/permits and results of further consultations with stakeholders. The EMP will be made binding on all contractors and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

A. Implementation arrangement

160. The Ministry of Urban Development will continue to be the executing agency and KUKL, through its existing PID, will continue to be the implementing agency for small works and all civil works related to BDS and DNI. A second implementing agency, the MWSDB, will implement three packages: (i) Sundarijal water treatment plant capacity expansion (works); (ii) supervision of Sundarijal water treatment plant expansion works (consultancy); and (iii) design of civil works for Melamchi Phase 2, which includes source augmentation and a future treatment plant of 340 MLD in Sundarijal (consultancy). KUKL will recruit and manage consultants for the NRW management. This arrangement is in line with the institutional framework of the Kathmandu Valley's water sector, which separates responsibilities for capital development of bulk water supply (source and treatment systems) from the distribution system.

161. A project steering committee has been established and is chaired by the Secretary, Ministry of Urban Development. The municipalities to be covered through the additional financing will be represented on the committee. PID is currently being supported by a project management consultant (PMC) and a design and supervision consultant (DSC 3). DSC 3 will finalize the detailed designs for the DNI packages; and a new consultant (DSC 5) will be recruited to supervise all new works under the additional financing.

162. A safeguard unit within the PID is already established and headed by a senior environmental engineer with adequate support staff. The PID, with assistance from the project DSC is to do the following: (i) screen all sub-projects for environmental impacts and categorization; (ii) prepare IEEs for any sub-projects defined after ADB Board approval; (iii) confirm the IEE or EMP is updated based on detailed designs; (iv) confirm whether EMPs are included in bidding documents and civil works contracts; (v) provide oversight on environmental management aspects of the project and ensure EMPs are implemented by PID, DSC, and contractors; (vi) facilitate and confirm overall compliance with all government rules and regulations regarding forest and road permits as well as any other approvals as relevant; (vii) supervise and provide guidance to the contractors to properly carry out the environmental assessments; (viii) review, monitor and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary; (ix) consolidate quarterly environmental monitoring reports from DSC and submit semi-annual monitoring report to ADB; (x) ensure timely disclosure of final IEEs or EMPs in locations and forms accessible to the public; and (xi) take corrective actions when necessary to ensure no environmental impacts.

163. The MWSDB, with assistance from the construction supervision consultant of WTP expansion works is to do the following: (i) provide oversight on environmental management aspects of the works contract and ensure EMPs are implemented by the supervision consultant and contractors; (ii) facilitate and confirm overall compliance with all government rules and regulations regarding forest and road permits as well as any other approvals as relevant; (iii) supervise and provide guidance to the contractors to properly carry out the environmental assessments; (iv) review, monitor and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary; (v) consolidate quarterly environmental monitoring reports from the consultant and submit semi-annual monitoring report to ADB; (vi) ensure timely disclosure of final IEEs/EMPs in locations and forms accessible to the public; and (vii) take corrective actions when necessary to ensure no environmental impacts.

B. EMP Tables

164. Tables 16 to 18 show the potential adverse environmental impacts, proposed mitigation measures, monitoring program, responsible parties, and cost of implementation. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. It includes all relevant environmental parameters, description of sampling stations, frequency of monitoring, applicable standards, responsible parties, and estimated cost.

165. During construction phase, the contractor is required to submit package-wise and site-specific EMEP based on the EMP to PID for review and approval. A copy of the approved EMEP must be kept on work sites at all times. The contractor will be required to (i) establish an operational system for managing environmental impacts; (ii) allocate a budget for compliance to EMP; (iii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iv) implement any corrective or preventative actions set out in safeguards monitoring reports that PID will prepare from time to time to monitor implementation of the IEE and EMP.

C. Reporting

166. The environmental monitoring of the project includes field supervision and semi-annual reporting of project activities prior to, during, post-construction and operation, in order to ensure that the works are being carried out in accordance with the approved design, and that the

environmental mitigation measures are fully implemented in accordance with the EMP. A sample environmental monitoring report, which is also used for KVWSIP, is provided in **Appendix 8**.

Table 16: Pre-construction Environmental Management Plan

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
Consents, permits, clearances, no objection certificates (NOCs). Failure to obtain necessary consents, permits, NOCs can result in design revisions and/or stoppage of works.	The project must obtain no-objection letters and agreements for (i) temporary easements to land and properties; (ii) construction in Darbar and Patan Squares and other heritage areas as necessary from the Department of Archaeology, as well as conducting Archaeological Impact Assessments or other procedures approved by DOA, if required; (iii) digging of roads from the Department of Roads, Lalitpur submetropolis and Kathmandu metropolis; and (iv) construction and cutting of	PID Safeguards Unit	Follow up with relevant authorities on permits including Departments of Archaeology, Roads, Forest, Parks, etc.	Checking of records	all necessary consents, permits, clearance, NOCs, obtained prior to start of civil works. Acknowledged in writing and provided with report on compliance to consents, permits, clearance, NOCs. all conditions and provisions if necessary. included in detailed design drawings and documents	As required	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	trees in Balaju (if unavoidable, as works will be within the existing access road) from the Shivapuri Nagarjun National Park and Department of Forest.							
Securing the project sites	- Land areas required by the project should be demarcated or pegged. - Notify affected sensitive receptors by providing sign boards, and/or any other form/information they can understand, about the nature and duration of construction works and contact numbers for concerns/complaints	PID with assistance from DSCs to ensure sites are demarcated	Fencing/demarcation of project sites Signages and information provided	Visual inspection	Secured sites Affected stakeholders notified	Upon finalization of detailed design, locations and alignments	PID	PID
Erosion	- Develop an erosion control and re-vegetation plan	PID safeguards unit to liaise with DSC	Erosion control measures incorporated	Checking of records and design documents	Erosion control included in design	Upon finalization of detailed design, locations and	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	to minimize soil loss and reduce sedimentation to protect water quality. - Minimize the potential for erosion by balancing cuts and fills to the extent feasible. - Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure). - Minimize the amount of land disturbed as much as possible. Use existing roads, disturbed areas, and borrow pits and quarries when possible. Minimize vegetation removal. Stage		in the detailed design documents			alignments		

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	construction to limit the exposed area at any one time.							
Impacts on Utilities	Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase. Prepare a contingency plan to include actions to be done in case of unintentional interruption of services. Obtain from PID the list of affected utilities and operators and coordinate closely with relevant government departments. If relocations are necessary, coordinate with the providers to	PID safeguards unit and DSC to prepatre contigency plan	Contigency plan	As per contigency plan	Minimum service interruption to extent possible	Upon approval of contigency plan	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	relocate the utility.							
Water supply service interruption	Plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration). Provide alternative potable water to affected households and businesses for the duration of the shut-down. Liaise with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.	PID safeguards unit and DSC to prepatre contigency plan	Frequency and location of interryuptions	Checking of records	Servce interruption to minimum extent possible Water supply provided to affected people	As required	PID	PID
Impacts Physical Cultural Resources	- Consult Department of Archaeology to obtain an expert assessment of	PID safeguards unit to prepare chance find protocol	Chance find protocol Consultations with Department	Checking of Records	Chance find protocol develop ASuthorities and	Prior to finalization of detailed design of DNI 8	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	the archaeological potential of the pipe alignments. Consider alternatives if the site is found to be of medium or high risk. - Include interest groups (e.g., UNESCO, NGOs, etc) in consultation forums as project stakeholders so that their expertise can be made available. Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.		of Archaeology and other interest groups (UNESCO, etc)		stakeholders consulted and isuues/concers raised addressed in the project design			

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
Sites for construction work camps and areas for stockpile, storage and disposal	Criteria to be considered: Will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems, etc. Residential areas will not be considered so as to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Disposal will not be allowed near sensitive areas or areas which will inconvenience the community. The construction camp, storage	PID safeguards unit to review and approve sites	Proposed sites	Field visit Check of records Photo-documentation	Within critera	Prior to mobilization of contractors	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	of fuel and lubricants should be avoided at the river bank. The construction camp site/s, including amenities for the workers, should be finalized in consultation with PID.							
Impacts on Sources of construction materials.	Use quarry sites and sources permitted by government. Verify suitability of all material sources and obtain approval from PID. If additional quarries are required after construction has started, obtain written approval from PID. Submit to PID on a monthly basis documentation of sources of materials.	PID safeguards unit to review and verify approved sites	Sources of materials It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of PID and other relevant authorities, as required.	Checking of records	Approved sites	Prior to start of civil works	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
Impacts on Access	Require contractor to prepare traffic management plan to: (i) plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (ii) schedule transport and hauling activities during non-peak hours; (iii) locate entry and exit points in areas where there is low potential for traffic congestion; (iv) keep the site free from all unnecessary obstructions; (v) drive vehicles in a considerate manner; (vi) coordinate with the Kathmandu Metropolitan Traffic Police Division for	PID safeguards unit to review and approve the traffic management plan	Traffic management plan (refer to template attached to IEE)	Checking of traffic management plan	Traffic management plan coordinated with local traffic enforcers Affected routes and alternative routes identified	Prior to start of civil works	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; (vii) notify affected sensitive receptors by providing sign boards with information about the nature and duration of construction works and contact numbers for concerns/complaints (viii) provide access to affected households (walkways, metal sheet, planks, etc.) along across trenches for pipelaying during the construction phase.							
Impacts on Social resources	Core labor standards need to be complied with. Minors	PID to communicate to contractors	Records of employees	Checking of records	No minors employed Equal	As work progresses	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	should not be allowed to work at any time. Wages should be settled by the District Wage Evaluation Committee (DWEC), with the list of employees finalized and equal pay given to men and women.				opportunities for women Equal pay for men and women			
Establishment of baseline environmental conditions prior to start of civil works	Conduct ambient noise level monitoring (include location/s, time of monitoring, photos, and GPS coordinates) Conduct water quality monitoring (include location/s, time of monitoring, photos, and GPS coordinates) Conduct air quality monitoring (include location/s, time of monitoring,	PID Safeguards unit	Baseline conditions	As per approved methodologies (refer to EPR 1997)	to be included in updated IEE	During detailed design stage	PID	PID

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost of Mitigation Measures Implementation
	photos, and GPS coordinates) Conduct wind directions monitoring (WTP site) Conduct documentation of location of components, areas for construction zone (camps, staging, storage, stockpiling, etc.) and surroundings (within direct impact zones). Include photos and GPS coordinates							
Safeguards Orientation	Prior to start of civil works, the contractor is required to (i) attend a safeguards orientation program; and (ii) submit to PID for review and approval, the EMEP together with the pre-construction required plans.	PID safeguards unit to provide orientation to contractors	Attendance records	Checking of records	Contractors undertaken safeguards orientation	Prior to mobilization	PID	PID

Table 17: Construction Environmental Management Plan

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
Soil erosion and slope instability due to excavation	separate stockpiles of topsoil in a safe yard for further use; dispose spoils at designated and stabilized sites; compact backfill of excavated areas, including replacement of topsoil; avoid work during the rainy season as much as possible; mulching to stabilize exposed areas; use bioengineering techniques (e.g. revegetating areas promptly); provide channels and ditches for post-construction flows; line of steep	Contractor	Erosion control measures	Site inspection	No erosion No unstable slopes	Monthly	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	channels and slopes (e.g. use of jute matting); and prevent off-site sediment transport using settlement ponds, silt fences, and quick backfilling. To encourage quick backfilling, short sections should be planned to complete works within 1-2 days, which will limit the time of disturbance to the community							
Impacts on surface water quality	limit construction to the dry season only; use river diversions with bunds; remove excavated materials immediately do not allow stockpiling of materials near water bodies check on a	Contractors	Surface water quality	Visual inspection	No increase in turbidity No project-related wastes disposed/drained to nearby bodies of water	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	daily basis, any construction related materials that may have fallen into water bodies and remove immediately bund local wells and springs and irrigation canals from temporary spoil dumps; monitor local wells and spring-fed spouts or kuwas, particularly downhill of excavations, plus temporary supply provided if flow is affected; require permeable base and side backfill at deep excavated sites; and provide alternate source of drinking water at affected location.							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
Water and land pollution	Avoid putting up construction labor camps and facilities within the drainage area or adjacent to water bodies; Prepare and implement a waste management plan. Manage solid waste according to the following hierarchy: reuse, recycling and disposal. Include in waste management plan designated/approved disposal areas. Coordinate with pid for beneficial uses of excavated soils/silts/sediments or immediately dispose to designated areas. Recover used oil and lubricants and reuse; or	Contractor	Project sites and surrounding Condition of adjacent bodies of water	Visual inspection	No visible deterioration No project-related materials and wastes on adjacent land and biiews of water	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	remove from the sites. Avoid stockpiling and remove immediately all excavated soils, excess construction materials, and solid waste (removed concrete, wood, trees and plants, packaging materials, empty containers, oils, lubricants, and other similar items). Provide designated areas with collection of bins for wastes; Provide toilet facilities and prohibit open defecation; and Prohibit washing of vehicles next to rivers and streams. provide training to the workforce on managing							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	wastes (reduce, reuse, recycle) and occupational health and safety (ohs) measures during construction							
Impacts on air quality and increase in levels of noise and vibrations	Conduct dust suppression on roads or at open sites by sprinkling water as required at regular intervals; Cover earth stockpiles using plastic sheets or cement jute bags; Monitor dust (tsp, pm10), sound, and vibrations at regular intervals (Appendix 4 of the IEE gives the national ambient air quality standards for Nepal and Appendix 5 of the IEE gives the recommended	Contractor	Ambient air quality (dust) Noise level Level of vibrations from heavy equipment	Use of methods approved as per EPR 1997	Within permissible levels No damages due to vibrations	As work progresses	Measurements – contractor Visual inspection and checking of records - PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	standards for vibration from construction sites.); Limit vehicle speeds and banning power horns; Ensure vehicles comply with the national vehicle mass emission standards, 2056 bs; Fit vehicles with mufflers to control noise; Maintain vehicles regularly; Prohibit operation of crushing plants and construction vehicles between 7 p.m. And 6 a.m. In residential areas Prohibit heavy equipment and machineries in protected physical and cultural resources Compensate damages to buildings and							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	other properties caused by vibrations							
Impacts on biological environment	Avoid tree cutting, and if unavoidable, cut only trees that are marked and have been approved by the Shivapuri Nagarjun National Park/Department of Forestry for removal, and planting and rearing tree saplings at the rate of 25 saplings for each felled tree; Prohibit use of fuel-wood and timber collection; Prohibit hunting and the illegal collection of protected animals and plants; Provide cooking facilities to the workforce; Compensate	Contractor	Number of trees to be cut Baseline environmental condition compared to construction-period conditions Cooking facilities provided to workers Schedule of work in sites near bodies of water	Visual inspection Checking of records	As per approved replantation plan	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	private trees and community forests affected; For works near water bodies and river crossings, limit activities during dry season only, carry out bunding off of active sections, and temporarily divert water course.							
Impacts on physical cultural resources	Confirm with PID the archaeological potential of the pipe alignments. Consider alternatives if the site is found to be of medium or high risk. Follow PID's protocol in conducting any excavation work Ensure no damage to structures/properties near construction zone. Implement good	Contractor	As per chance find procedure As per clearance from Department of Archaeology	Visual inspection Checking of records	No impact on physical cultural resources	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	housekeeping. Remove wastes immediately. Prohibit stockpiling of materials that may obstruct/slow down pedestrians and/or vehicle movement. Ensure workers will not use nearby/adjacent areas as toilet facility. Provide instructions to workers on event of chance finds for archaeological resources. Works must be stopped immediately until such time chance finds are cleared by experts. If a worker finds any archaeological object in his area, contractor is required to fill							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	the description of such object in the form (Appendix 7 of the IEE). Immediately send the accomplished form together with photographs of such project to PID who will contact the Chief District Officer immediately. PID will submit the findings in writing to the Department of Archaeology within 35 days as per Ancient Monuments Protection Act, 1956, and Rules, 1989. Photograph all sites within the heritage area to enable before and after comparison Reinstate all roads to original character, especially in heritage areas.							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	Avoid disturbance to any historic or heritage buildings or structures by taking necessary precautions (working away from heritage buildings, hand digging, no heavy equipment, and others); and for pipe-laying works in roadways within UNESCO heritage areas (e.g., Patan Square and Darbar Square), ensure the following measures: (a) no vibrating machinery near heritage buildings; (b) only hand digging allowed; (c) informing the community prior to daily construction of sections; (d)							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	ensuring no blockage to tourist areas; (e) having clear signage related to KUKL works; (f) ensuring reinstatement of roads to original condition;, (g) ensuring extra measures (fencing and/or barriers) to protect tourists and public from construction site, and (h) ensuring that a construction supervisor is onsite at all times							
Increase in traffic and impacts on accessibility and socio-economic activities	Avoid full street closure to extent possible, and limit number of full closure days where unavoidable; Hold community meetings prior to construction to ensure awareness; Provide walkways and metal sheets	Contractor	Alternative routes Number and sufficiency of walkways, planks, etc provided across trenches Type and number of barricades, signs, etc. provided to affected	Checking of records	As per traffic management plan Complaints addressed as per GRM	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	where required to maintain access of people and vehicles Provide sign boards and/or other form/language affected people can understand to inform them of the nature and duration of construction works and contact numbers for concerns/complaints Increase the workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools Develop a traffic management plan and coordinate with pid on transportation routes and schedule (Appendix 6		people Number of complaints received from affected people					

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	provides basic principles and strategies for managing traffic) Schedule transport and hauling activities during non-peak hours. Communicate road detours via visible boards, advertising, pamphlets, etc Ensure heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites Ensure that there are barriers in populated residential, business, or tourist areas to ensure that the public is not allowed near work site Avoid involuntary displacement Ensure trenches are							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	open only 1-3 days in areas of businesses activity; If income loss occurs, compensate impacts and rehabilitate according to agreed resettlement plan (rp); Compensate for any loss of crops, trees, and other natural resources according to agreed rp; Make arrangements for a grievance redress committee to look into the grievances; Restoring temporary sites to their natural or stable conditions as per agreements with the land owners; Make sure that the proponent reports in writing that							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	temporary areas have been vacated and restored to pre-project conditions before acceptance of the works; Provide employment opportunities to the affected people; Provide all possible assistance to the displaced people until they are settled; Provide disturbance and rehabilitation costs; Compensate for damages caused by construction-related vibrations							
Impacts on occupational health and safety	Overall, the contractor should comply with IFC EHS Guidelines on Occupational Health and Safety (this can be downloaded	Contractor	Number of OHS training conducted Number of workers undertaken OHS orientation	Visual inspection Checking of records	Core labor standards OHS plan Zero accident	As work progresses	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2boccupational%2bhealth%2Band%2bsafety.pdf?MOD=AJPERES). The contractor will be required to: Avoid worker exposure to noise level greater than 85 dba for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. Develop comprehensive site-specific health and safety (H&S) plan as part of EMEP. The overall objective is to provide guidance to contractors on establishing a		First aid station and content of kits Condition of workers camps/facilities Provision of clean eating area and potable water Provision of toilet facilities					

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project. Include in H&S plan measures such as: (i) type of hazards during excavation works; (ii) corresponding personal protective equipment for each identified hazard; (iii) H&S training for all site personnel; (iv) procedures to be followed for all site activities; and (v) documentation of work-related accidents. Provide							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	compulsory H&S orientation training to all new workers to ensure that they are apprised of the rules of work at the site, personal protective protection, and preventing injury to fellow workers. Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site as well as at construction camps. Provide medical insurance coverage for workers. Secure construction zone from unauthorized intrusion and accident risks. Provide							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	supplies of potable drinking water. Provide clean eating areas where workers are not exposed to hazardous or noxious substances. Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted. Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas. Ensure moving equipment is							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	outfitted with audible back-up alarms. Mark and provide sign boards in the construction zone, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. Provide regular health checkups, proper sanitation and hygiene, health care, and control of epidemic diseases to the workforce; Launch awareness programs concerning human							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	trafficking and the possibility of spread of stds and HIV/AIDS using brochures, posters, and signboards							
Post Construction`	Backfill any excavation and trenches, preferably with excess excavation material generated during the construction phase. Restore the contours of the river bed and banks immediately, if disturbed during construction works Use removed topsoil to reclaim disturbed areas. Stabilize all areas of disturbed vegetation using weed-free native shrubs,	Contractor	Pre-construction and post-construction conditions	Visual inspection Checking of records	Restored to pre-construction conditions	Upon completion of work	PID	Contractor

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	grasses, and trees. Restore access roads, staging areas, and temporary work areas. Restore roadside vegetation. Remove all tools, equipment, barricades, signs, surplus materials, debris, and rubbish. Demolish buildings/structures not required for O&M. Dispose in designated disposal sites. Monitor success of re-vegetation and tree re-planting. Replace all plants determined to be in an unhealthy condition. Request in writing from PID that construction zones have							

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Cost for Mitigation Measures Implementation
	been restored.							

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Table 18: Operations and Maintenance Environmental Management Plan

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Costs for Mitigation Measures Implementation
Increased sewerage	Environmental management is covered in the O&M plan of KVWWIP							
Pollution due to WTP Operation	Prepare a sludge disposal plan and include it in the O&M manuals. Conduct analysis of sludge cake prior to disposal Conduct analysis of physical and chemical quality of pre-settling water which will not be re-utilized prior to discharge. Prepare chemical spills response plan. Closely observe flow rate, head loss, turbidity levels for each filter, backwashing and air	WTP Operator	Sludge cake quality (heavy metals content) Pre-settling water to be discharged (parameters as per EPR 1997)	Laboratory analysis	Within permissible limits	Prior to disposal	WTP Operator	WTP Operator

Potential Impacts	Mitigation Measures	Responsible for Implementation	Parameters to be monitored	Method of Monitoring	Indicators	Frequency	Responsible for Monitoring	Costs for Mitigation Measures Implementation
	scouring cycles to provide operator with an evaluation of the filter's condition and will indicate the need for corrective action, inspection or other actions.							

D. EMP Implementation Cost

167. As part of good engineering practices in the project, there have been several measures undertaken, such as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, and others, the costs of which will be included in the design costs of the project. The IEE costs include monitoring costs during construction and capacity building costs for environmental management. Costs of all mitigation measures during the construction phase will be included in the tender and contract documents and will be borne by the contractors. PID, using government counterpart funds, will bear any resettlement-related costs. A domestic community awareness and participation consultant firm will be hired to facilitate community awareness and participation programs on an intermittent bas, and a budget will be included for these relevant costs.

168. All costs related to cutting and replanting of trees shall be borne by the project itself through the PID. It is mandatory to plant 25 saplings for every tree cut, and to maintain them for 5 years. The project will follow the existing track during the laying of the pipeline so as to avoid the cutting of trees. The cost of maintaining a tree for 5 years has been estimated at $600. It is not expected that trees will be cut; however, for budget purposes, a total amount of $180,000 has been earmarked, in the event that 300 trees would require cutting. The tree-cutting budget is part of the government counterpart funds under the project budget. The government will make available or authorize MPPW and KUKL to make available necessary financial and human resources to fully implement the EMP.

169. Before construction, PID will develop detailed responsibilities and requirements for contractors, and will provide detailed cost estimates of mitigation measures and environmental monitoring in the construction contracts. PID will also detail the responsibilities of their environmental management offices and prepare their work schedules.

170. Before operation, PID will develop detailed work plans for environmental management and monitoring during operation, based on the EMP. These work plans will be submitted to the concerned persons to help them supervise implementation.

X. CONCLUSIONS AND RECOMMENDATIONS

171. Overall the environmental impacts of the project will be positive. Some negative impacts are anticipated during construction, but in specific areas and for short duration (dust, noise, traffic problems, access to buildings). It is expected that the adverse environmental impacts of the planned water supply project for the Kathmandu Valley will in general not be significant, and can be easily and reasonably mitigated and prevented through mitigation measures and regular monitoring during design, construction, and operation, as outlined in the EMP.

172. The project will contribute significantly to the improvement of the health and quality of life of the people due to the water supply improvements.

173. The project is unlikely to cause significant adverse impacts. The potential adverse impacts associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

174. Based on the findings of the IEE, the classification of the project as category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009).

APPENDIX 1: Rapid Environmental Assessment (REA) Checklist

Screening questions	Yes	No	Remarks
A. Project siting Is the project area…			
▪ Densely populated?	✓		In many areas of the Kathmandu Valley, the average urban density exceeds 40,000-45,000 persons per km^2 and at the core of Kathmandu the density exceeds 80,000 per km^2. Although Kathmandu Valley only covers 0.43% of the total area of Nepal, it has about 7% of the total population.
▪ Heavy with development activities?		✓	The area is predominantly residential and commercial. There are ongoing roads works.
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	✓		The Kathmandu Valley has a number of historic cultural sites (temples) which may be adjacent to the ROWs where work will take place. The project will ensure the following: (i) consultations with any government agency or NGOs (including UNESCO) with responsibility (and jurisdiction) over cultural/archaeological sites; (ii) permissions received from relevant agencies; (iii) construction guidelines in EMP; and (iv) chance finds requirements.
• Protected area		✓	There are no environmentally sensitive areas within the project area. The project will occur primarily within the Kathmandu Valley urban boundaries.
• Wetland			
• Mangrove			
• Estuarine			
• Buffer zone of protected area			
• Special area for protecting biodiversity			
• Bay			
B. Potential environmental impacts Will the project cause…			
• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	The intakes are located in isolated intact watersheds. Additional water treatment is included in a parallel project financed by JICA under the ongoing ADB Melamchi Project (Loan 1820). The distributed water is to comply with the National Drinking Water Quality Standards as per the approved EMP for the project.
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	The project will ensure the following: (i) consultations with any government agency or NGOs (including UNESCO) with responsibility (and jurisdiction) over cultural/archaeological sites; (ii) permissions received from relevant agencies and organizations; (iii) construction guidelines in EMP; and (iv) chance finds requirements. Potential adverse impacts during construction will be addressed through EMPs. All mitigation requirements will be included in the contract documents. Any regulations during construction will be included and monitored through the EMP.
▪ Hazard of land subsidence caused by excessive ground water pumping?		✓	To avoid ground subsidence and over- exploitation, KVWSMB is undertaking a Groundwater Management and Regulation Policy Preparation Study (ADB SDP Loan 2059) that will establish processes to regulate and control or prohibit the extraction and use of groundwater within the Kathmandu Valley. The ADB Melamchi Project (Loan 1820) will replace /install flow and water depth instrumentation on all ground water tube wells for extraction monitoring.

Screening questions	Yes	No	Remarks
▪ Social conflicts arising from displacement of communities?		✓	No displacements required. Land for service reservoirs was previously acquired under the ongoing ADB Melamchi Project (Loan 1820) and monitored through implementation of approved resettlement plan. Temporary impacts to businesses may occur during construction and are to be addressed through specific measures, including compensation, in the EMP. Any involuntary resettlement impacts identified will be addressed in the Resettlement Plan (RP).
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	Conflicts in abstraction are addressed through the ongoing ADB Melamchi Project (Loan 1820) RP. The approved RP provides allowances for water mill and irrigation users affected by the project, as well as the social uplift program (SUP) targeted at affected communities. The ongoing project is closely monitored by ADB, and any conflicts are managed through corrective actions in coordination with the government.
▪ Unsatisfactory raw water supply (e.g. Excessive pathogens or mineral constituents)?		✓	Addressed through the ongoing ADB Melamchi Project (Loan 1820). Any distributed water will be treated and ensured to comply with the National Drinking Water Quality Standards.
▪ Delivery of unsafe water to distribution system?		✓	Water will be treated under the ongoing ADB Melamchi Project (Loan 1820) and additional financing which includes rehabilitation of existing and construction of distribution network.
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		✓	The ongoing Melamchi Project (Loan 1820) includes fencing and other protection work for water intakes.
▪ Over pumping of ground water, leading to salinization and ground subsidence?		✓	Salinization due to salt bearing strata is not a problem in the Kathmandu Valley. To avoid ground subsidence and over-exploitation, KVWSMB is undertaking a Groundwater Management and Regulation Policy Preparation Study (ADB SDP Loan 2059) that will establish processes to regulate and control or prohibit the extraction and use of groundwater within the Kathmandu Valley. The ADB Melamchi Project (Loan 1820) will replace/install flow and water depth instrumentation on all ground water tube wells for extraction monitoring.
▪ Excessive algal growth in storage reservoir?		✓	Storage reservoirs are only for treated water. The water is chlorinated and the reservoirs covered to prevent algal growth.
▪ Increase in production of sewage beyond capabilities of community facilities?	✓		The ADB Kathmandu Valley Wastewater Management Project (KVWWMP – L3000) will improve the existing collection and treatment systems by rehabilitating existing treatment plants and expanding the sewerage network, as well as providing a septage treatment facility.
▪ Inadequate disposal of sludge from water treatment plants?		✓	Disposal of sludge to be done at designated sites as per the approved EMP of the ongoing ADB Melamchi Project (Loan 1820).
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	Not applicable. Buffer zones included in designs of WTPs.
▪ Impairments associated with transmission lines and access roads?	✓		Good construction practices will mitigate transmission line impairments and will be specified in the EMP. A section-wise approach will also limit impairments to traffic and businesses during construction.

Screening questions	Yes	No	Remarks
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	Not applicable. WTP designs include dedicated areas for chemical storage. Workers will be trained on proper chemical handling and emergency response procedures.
▪ Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		✓	During construction, workers will be required to undergo health and safety induction course prior to mobilization to construction sites. During O&M, workers will be trained on proper chemical handling and emergency response procedures.
▪ Dislocation or involuntary resettlement of people?		✓	No involuntary resettlement impacts envisioned. Lands for service reservoirs were previously acquired under the ongoing ADB Melamchi Project (Loan 1820) and monitored through implementation of the approved RP. Any involuntary resettlement impacts identified will be addressed in the RP.
▪ Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?		✓	Not anticipated. The contractor will be encouraged to hire local workers from the local labor force.
▪ Noise and dust from construction activities?	✓		Temporary increase in noise level and dusts may be caused by excavation equipment, and the transportation of equipment, materials, and people. The impacts are negative but short-term andsite-specific within a relatively small area and reversible through mitigation measures.
▪ Increased road traffic due to interference of construction activities?	✓		Temporary increase in road traffic may be caused by excavation works, and transportation of equipment, materials, and people. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Traffic management plan will form part of the EMP.
▪ Continuing soil erosion/silt runoff from construction operations?	✓		Due to excavation and run-off from stockpiled materials. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Good construction practices will mitigate soil erosion and silt runoff and will be specified in the EMP.
▪ Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	The project will include development of O&M manuals to ensure facilities are kept in working condition, including maintenance of filters and monitoring of disinfection/chlorination system. Any distributed water must comply with the National Drinking Water Quality Standards.
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	The project will include development of O&M manuals to ensure facilities are kept in working condition, including checking and maintenance of BDS and distribution network. Any distributed water must comply with the National Drinking Water Quality Standards.
▪ Accidental leakage of chlorine gas?		✓	Not applicable. Chlorine gas will not be used.
▪ Excessive abstraction of water affecting downstream water users?		✓	Conflicts in abstraction are addressed through the ongoing ADB Melamchi Project (Loan 1820) RP. The approved RP provides allowances for water mill and irrigation users affected by the project, as well as the SUP targeted at affected communities. The ongoing project is closely monitored by ADB, and any conflicts are managed through corrective actions in coordination with the government.
▪ Competing uses of water?		✓	
▪ Increased sewage flow due to increased water supply	✓		The KVWWMP (Loan 3000) will improve the existing collection and treatment systems by rehabilitating existing treatment plants and expanding the sewerage
▪ Increased volume of sullage (wastewater	✓		

Screening questions	Yes	No	Remarks
from cooking and washing) and sludge from wastewater treatment plant			network, as well as providing a septage treatment facility. All wastewater effluents must meet government treatment standards. Sludge disposal from the sewage treatment plant is addressed in KVWWMP EMP.
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Improved management systems through capacity building and institutional development will ensure reduced burden on services and infrastructure.
▪ Social conflicts if workers from other regions or countries are hired?		✓	Priority in employment will be given to local residents.
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		✓	Not applicable. Construction will not involve use of explosives and chemicals.
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		✓	Work areas will be clearly demarcated with signage and safety barriers, and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Nepal: Kathmandu Valley Water Supply Improvement Project – Additional Financing

Sector : Water and other urban infrastructure and services

Subsector: Urban Water Supply

Division/Department: SAUW/SARD

Screening Questions		Score	Remarks
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	Physical investments will not likely be affected due to the siting of project investments. For example all pipes will be constructed below ground, no investments will be sited in flood plains, etc.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea level, peak river flow, reliable water level, peak wind speed etc)?	0	Proposed investments will not pass through major cross drainages and river. Pipes are designed to handle peak flow demands.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No significant effect
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	No significant effect
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No significant effect

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

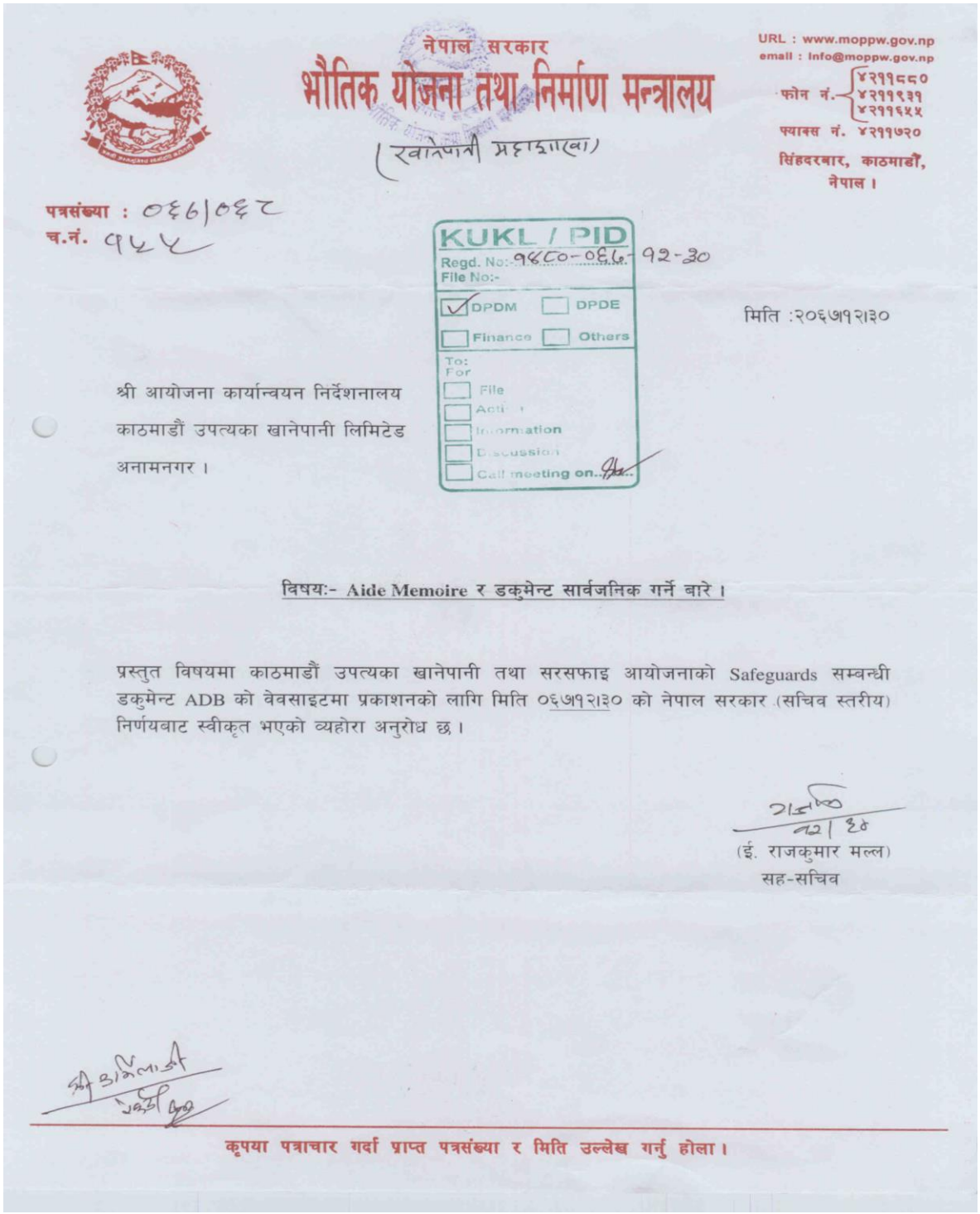
Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low

Other Comments: None

Prepared by: _____

APPENDIX 2: GOVERNMENT LETTERS CONFIRMING COMPLIANCE WITH GOVERNMENT RULES



नेपाल सरकार
भौतिक योजना तथा निर्माण मन्त्रालय
(खानेपानी प्रभाग)

URL : www.moppw.gov.np
email : info@moppw.gov.np
फोन नं. ४२११८८०, ४२११९३१, ४२११६५५
फ्याक्स नं. ४२११७२०
सिंहदरबार, काठमाडौं, नेपाल ।

पत्रसंख्या : ०६६/०६८
च.नं. ९५५

KUKL / PID
Regd. No:- ९४८०-०६६-९२-३०
File No:-
☑ DPDM ☐ DPDE
☐ Finance ☐ Others
To:
For
☐ File
☐ Action
☐ Information
☐ Discussion
☐ Call meeting on...

मिति :२०६७१२।३०

श्री आयोजना कार्यान्वयन निर्देशनालय
काठमाडौं उपत्यका खानेपानी लिमिटेड
अनामनगर ।

विषयः- Aide Memoire र डकुमेन्ट सार्वजनिक गर्ने बारे ।

प्रस्तुत विषयमा काठमाडौं उपत्यका खानेपानी तथा सरसफाइ आयोजनाको Safeguards सम्बन्धी डकुमेन्ट ADB को वेवसाइटमा प्रकाशनको लागि मिति ०६७१२।३० को नेपाल सरकार (सचिव स्तरीय) निर्णयबाट स्वीकृत भएको व्यहोरा अनुरोध छ ।

(ई. राजकुमार मल्ल)
सह-सचिव

कृपया पत्राचार गर्दा प्राप्त पत्रसंख्या र मिति उल्लेख गर्नु होला ।

APPENDIX 3: ENVIRONMENT RELATED ACTS AND REGULATIONS IN NEPAL

Acts

1) Ancient Monuments Protection Act, 1956
2) Civil Aviation Act, 1958
3) Aquatic Animals Protection Act, 1960
4) Plant Protection Act, 1964
5) National Parks and Wild Life Conservation Act, 1987
6) Public Road Act, 1974
7) Trust Corporation Act, 1976
8) Tourism Act, 1978
9) King Mahendra Nature Conservation Trust Act, 1982
10) Soil and Watershed Conservation Act, 1982
11) Nepal Petroleum Act, 1983
12) Nepal Electricity Authority Act, 1984
13) Mines and Mineral Act, 1985
14) Pashupati Area Development Trust Act, 1987
15) Solid Waste (Management and Resource Mobilization) Act, 1987
16) Town Development Act, 1988
17) Kathmandu Valley Development Authority Act, 1988
18) Nepal Water Supply Corporation Act, 1989
19) The Constitution of the Kingdom of Nepal, 1990
20) Pesticides Act, 1991
21) Village Development Committee Act, 1991
22) District Development Committee Act, 1991
23) Municipality Act, 1991
24) Water Resources Act, 1992
25) Forest Act, 1992
26) Electricity Act, 1992
27) Motor Vehicle and Transportation Management Act, 1992
28) Labour Act, 1992
29) Industrial Enterprises Act, 1992
30) Nepal Tourism Board Act, 1996
31) Environment Protection Act, 1996

Rules

1) National Parks and Wild Life Conservation Rules, 1973
2) Plant Protection Rules, 1974
3) Wild Life Reserve Rules, 1977
4) Himalayan National Park Rules, 1979
5) Mountaineering Rules, 1979
6) King Mahendra Nature Conservation Trust Rules, 1984
7) Petroleum Rules, 1984
8) Khaptad National Park Rules, 1987
9) Ancient Monuments Protection Rules, 1989
10) Solid Waste (Management and Resource Mobilization) Rules, 1989
11) Water Resources Rules, 1993
12) Pesticides Rules, 1993
13) Labour Rules, 1993
14) Electricity Rules, 1993
15) Forest Rules, 1994
16) Buffer Zone Management Rules, 1995
17) Royal Bardiya National Park Rules, 1996

18) Conservation Area Management Rules, 1996
19) Vehicle and Transportation Management Rules, 1997
20) Environment Protection Rules, 1997

APPENDIX 4: NATIONAL AMBIENT AIR QUALITY STANDARDS FOR NEPAL

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum	Test Methods
TSP (Total suspended particulates)	$\mu g/m^3$	Annual	-	
		24 hours[a]	230	High volume sampling
PM_{10}	$\mu g/m^3$	Annual	-	
		24 hours[a]	120	Low volume sampling
Sulfur dioxide	$\mu g/m^3$	Annual	50	Diffusive sampling based on weekly averages
		24 hours[b]	70	
Nitrogen dioxide	$\mu g/m^3$	Annual	40	
		24 hours[b]	80	
Carbon monoxide	$\mu g/m^3$	8 hours[b]	10,000	
		15 minute	100,000	Indicative samples[c]
Lead	$\mu g/m^3$	Annual	0.5	Atomic Absorption Spectrometry, analysis of PM_{10} samples[d]
		24-hours	-	
Benzene	$\mu g/m^3$	Annual	20	Diffusive sampling based on weekly averages
		24-hours	-	

$\mu g/m^3$ = micrograms per cubic meter

[a] 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.

[b] 24 hourly standards for NO_2 and SO_2 and 8-hour standard for CO are not to be controlled before MOPE has recommended appropriate test methodologies. This will be done before 2005.

[c] 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 8 a.m.-10 a.m. or 3 p.m.-6 p.m. on a workday. This test method will be re-evaluated by 2005.

[d] If representativeness can be proven, yearly averages can be calculated from PM10 samples from selected weekdays from each month of the year.

APPENDIX 5: RECOMMENDED NOISE EXPOSURE LIMITS FOR THE WORK ENVIRONMENT - ADOPTED FROM OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

S.N.	Noise Exposure (dB)	Permissible Exposure (Hours and Minutes)
1	85	16 hrs.
2	87	12 hrs. –18 min.
3	90	8 hrs.
4	93	5 hrs – 18 min.
5	96	3 hrs.-- 30 min.
6	99	2 hrs. – 18 min.
7	102	1 hr. – 30 min.
8	105	1 hr.
9	108	40 min.
10	111	26 min.
11	114	17 min.
12	115	15 min.
13	118	10 min.
14	121	6.6 min.
15	124	4 min.
16	127	3 min.
17	130	1 min.

hr. = hour, min. = minutes, dB = decibel.
Source: Marsh, 1991.

RECOMMENDED AVERAGE EQUIVALENT SOUND LEVELS FOR PROTECTING THE PUBLIC HEALTH AND WELFARE

S.No.	Land Use	Measure	To Protect Against Activity Interference and Hearing Loss Effects (dB)
1	Residential including farm residences	Leq (24)	55
2	Commercial	Leq (24)	70
3	Hospitals	Leq (24)	55
4	Industrial	Leq (24)	70
5	Educational	Leq (24)	55
6	Recreational areas	Leq (24)	70
7	Farmland and general unpopulated land	Leq (24)	70

Source: U.S Environmental Protection Agency, 1974.
Note: Leq (24) = Equivalent sound level in decibels for 24 hours

RECOMMENDED STANDARDS FOR VIBRATIONFROM CONSTRUCTION SITES

Type of Restriction	Area Classified	
Standard value	I and II	85 dB
Work prohibited time	I	7 p.m.. – 7 a.m.
	II	10 p.m. – 6 a.m.
Maximum working duration	I	10 hrs. per day
	II	14 hrs. per day
Maximum consecutive working days	I and II	6 days
Working Prohibited Days	I and II	Saturdays and holidays

dB = decibel, hrs. = hours
Source: Vibration Regulation Law 64 of 1976, Japan.

Notes:
1. Area I, stands for areas to which one of the following descriptions applies:
(i) areas where maintenance of quiet is particularly needed to preserve the residential environment;
(ii) areas which require maintenance of quiet for residential purposes;
(iii) areas which must maintain quiet for commercial and industrial as well as residential purposes, and where there is a need to prevent vibration because a considerable number of houses are located therein; and
(iv) the neighborhoods of schools, hospitals, and the like.
Area II stands for areas where there is a need to preserve the living environment of inhabitants, other than of those in Area I.
2. Vibration level shall be measured at the boundary line of the specified construction work site.

RECOMMENDED LIMITS FOR ROAD TRAFFIC VIBRATION

Area	Day time	Night time	Applicable areas
I	65 dB	60 dB	Areas where maintenance of quiet is particularly needed to preserve a good living environment, and where quiet is called for us as the place is used for residential purposes.
II	70 dB	65 dB	Areas that need quiet for commercial and industrial as well as residential purposes, where there is a need to preserve the living environment of local inhabitants, and areas mainly serving industrial proposes where measures are needed to prevent the living environment of local residents from deteriorating.

dB = decibel
Source: Vibration Regulation Law 64 of 1976, Japan.
Note: Vibration level shall be measured at the boundary line of the road.

APPENDIX 6: SAMPLE TRAFFIC MANAGEMENT PLAN

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

(i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(ii) protection of work crews from hazards associated with moving traffic;
(iii) mitigation of the adverse impact on road capacity and delays to the road users;
(iv) maintenance of access to adjoining properties; and
(v) addressing issues that may delay the project.

B. Operating Policies for TMP

2. Figure A12.1 illustrates the operating policy for TMP of the DNI works.

C. Analyze the impact due to street closure

3. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

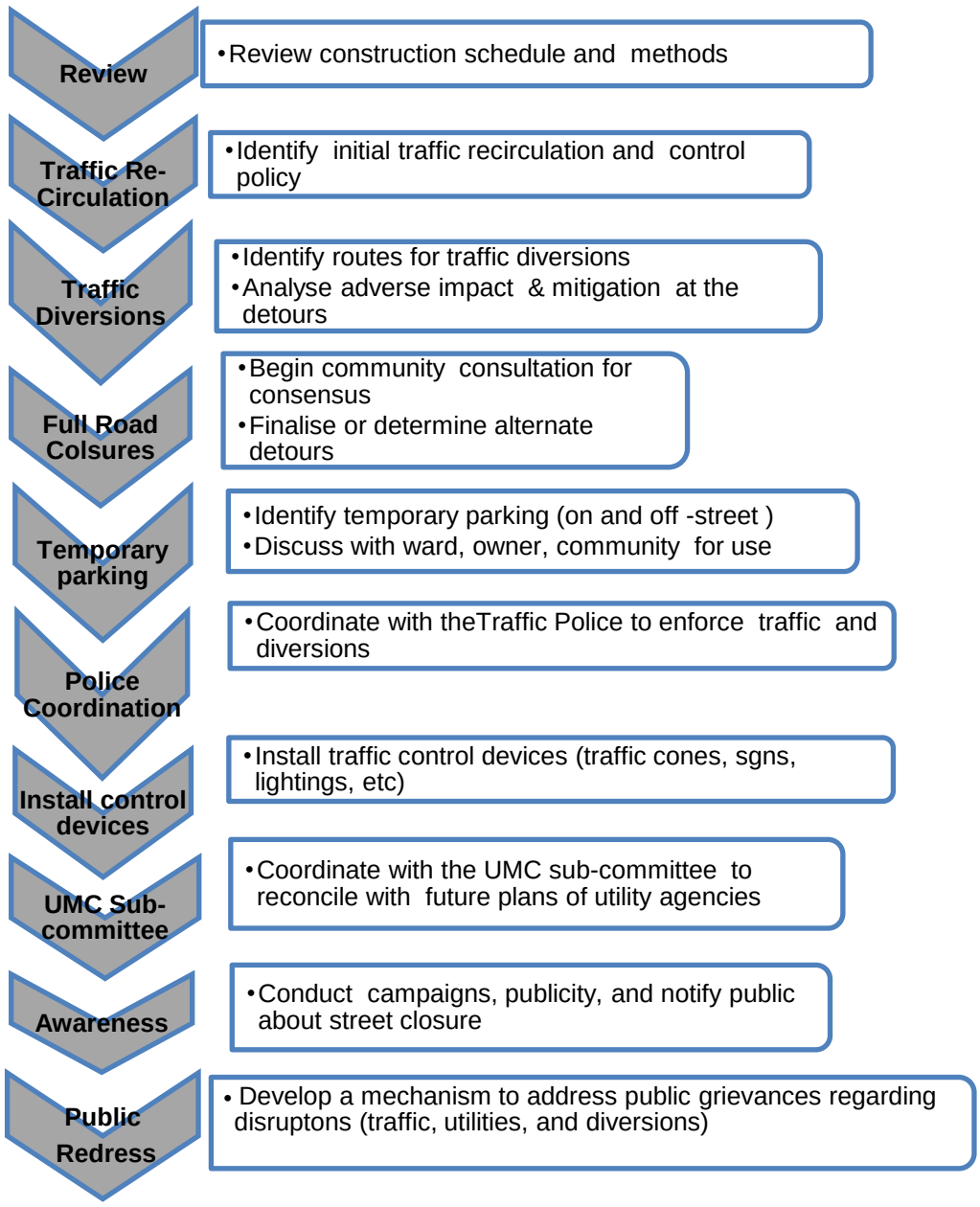
(i) approval from the ward office or community to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, Department of Roads, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
(iv) determining if additional traffic control or temporary improvements are needed along the detour route;
(v) considering how access will be provided to the worksite;
(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
(vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

4. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Friday night and ending on Sunday morning prior to the morning peak period.

D. Public awareness and notifications

5. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

Figure A12.2: Policy Steps for the TMP



6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through print, TV, and radio media. In addition, the project, in collaboration with the utility management

coordinator, will also seek the assistance of the ward office, local clubs, and others to post the public notice regarding street closure and traffic diversions in the future.

7. The utility management coordinator will also conduct an awareness campaign to educate the public about the following issues:

(i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
(ii) defensive driving behavior along the work zones; and
(iii) reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to employ a road safety education specialist to design an appropriate program for road safety, and to conduct the awareness programs.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools, civic centers and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the KUKL project directorate, office of both the contractor and consultant, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

(i) explain why the brochure was prepared, along with a brief description of the project;
(ii) advice the public to expect the unexpected;
(iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
(iv) educate the public about the safe road user behavior to emulate at the work zones;
(v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (website, name, telephone, mobile number of the contact person; and SMS service or traffic information on FM radio, e.g. Ujyalo FM Station); and
(vi) indicate the office hours of relevant offices.

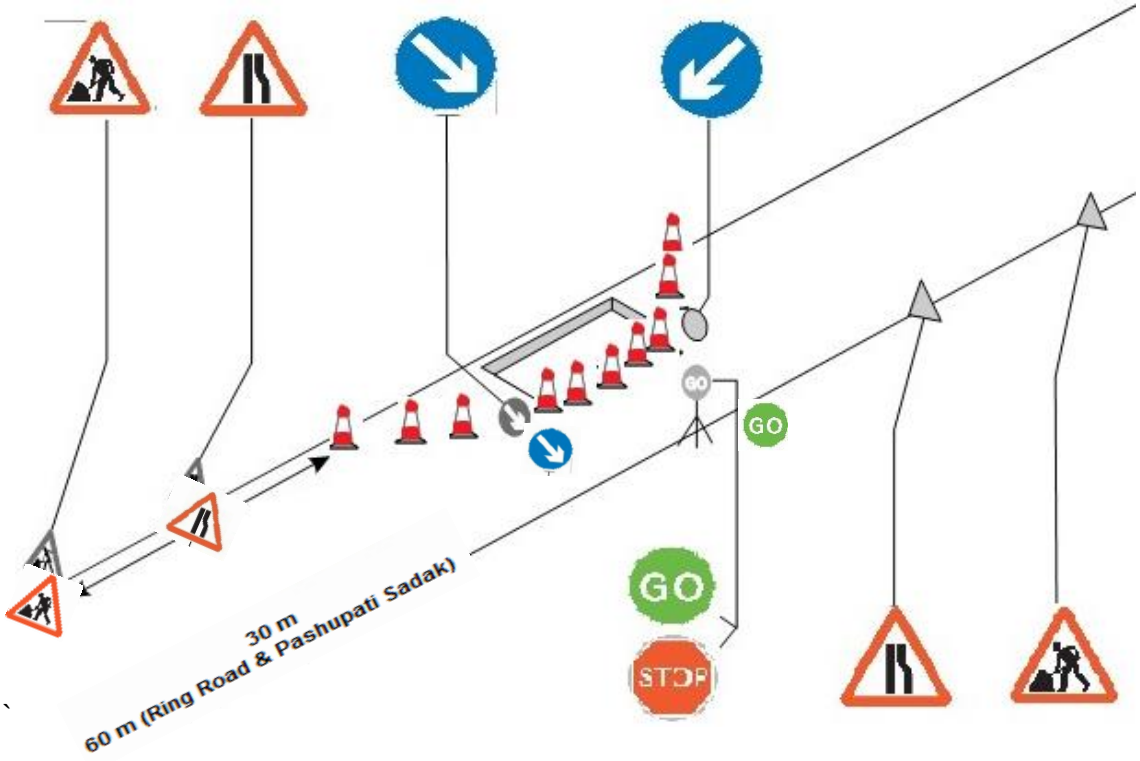
E. Install traffic control devices at the work zones and traffic diversion routes

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect the former as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones.

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place both at both minor streets and major streets such as PashupatiSadak and the Dhumbarahi-Chabahil section of Ring Road. As such, the traffic volume and road geometry vary, with the latter requiring more elaborate settings. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”). The work will closely follow the guidelines outlined in the DOR Traffic Sign Manual 1997 (which includes DOR 1996 document “Safety at Roadwork”) and other literature available in this respect.

12. **Figure A12.3** illustrates a typical set-up for installing traffic control devices at the work zone of the area.

Figure A12.3: Basic Layout for Delineation of a Work Zone (small area)



Note:
The Road Narrrows Ahead warning-sign shown are only required to cordon the DNI work-zones at Pashupati Sadak and Ring Road (Chabahil- Dhumbarahi section)

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the DNI works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones. Figure 5 clarifies that the "ROAD NARROWS" warning-sign is only necessary at the DNI works zones along PashupatiSadak and the Ring Road section, where high traffic speeds are likely during the off-peak hours and at night. All the temporary traffic signs should be reflectorized, especially for the works to be conducted during the nighttime, as per the DOR Traffic Sign Manual 1997.

14. All the traffic diversions should be properly delineated through proper "DIVERSION AHEAD" and "ROADWORK AHEAD" signs as indicated in Figure A12.4. In addition, the "B46" temporary warning sign for sharp bends used at the temporary diversion should be in place after the start of the taper of the traffic cones. Flashing beacons should be installed at the entry to the work zone and traffic diversion for night construction, or if backfilling of the DNI trench does not take place after the completion of a day shift.

Figure A12.4: Basic Layout for Delineation of a Work Zone (small area)

Source: DOR Traffic Sign Manual; Volume I; August 1997; Kathmandu, Nepal.

15. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. For the DNI and BDS works, one personnel is necessary at each entry to the diversion from both directions. These personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during nighttime.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions. In light of the ongoing load-shedding problem in Nepal, it is practical to use solar-powered LED lights, which are energy efficient, wherever feasible.

APPENDIX 7: Schedules 1 and 4 of the Ancient Monuments

Preservation Rules 2046 (1989)

Schedule-1

(Relating to Sub- rule 4.1.1)

Department of Archaeology

……

I am / We are going to carry out the following construction work in …… monuments conserved zone, located in ……of……..District, ……..Zone, within the following time period. Therefore, I/ We have filed this application for obtaining the approval of the Department. I am / We are ready to bear any punishment, as per the prevailing laws, if construction work is made other than written in this application.

Description of the construction work, which is going to be carried out within the monuments conserved areas and tentative time period to complete the construction: - ……

Of the applicant,

Name and Surname –

Signature –

Date –

Permanent Address–-

Temporary Address–

Schedule 4
(Relating to Subrule 4.3.1)
The Description of Archaeological Object Form 2

Zone:
District:

SNo.	Archaeological Object				Archaeological Object Found					Remarks
	Name	Material composition	Age (probable year)	Measurements (length, width, thickness, etc.)	VDC/Municipality	Ward no.	Village	Tole	Description of area	

The Local Officer:
Date:

Modified by the Ancient Monument Conservation (First Amendment) Rules, 2049 (1992) Appendix 10:

APPENDIX 8: SAMPLE ENVIRONMENTAL MONITORING FORMAT

This template must be included as an appendix in the EIA/IEE that will be prepared for the project. It can be adapted to the specific project as necessary.

I. INTRODUCTION

- Overall project description and objectives
- Description of subprojects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		☐	☐	☐	☐		
		☐	☐	☐	☐		
		☐	☐	☐	☐		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

(i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
(ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
(iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
(iv) Are there designated areas for concrete works, and re-fuelling?
(v) Are there spill kits on site and if there are site procedure for handling emergencies;

(vi) Is there any chemical stored on site and what is the storage condition?
(vii) Is there any dewatering activities if yes, where is the water being discharged;
(viii) How are the stockpiles being managed?
(ix) How is solid and liquid waste being handled on site?
(x) Review of the complaint management system; and
(xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

Overall Compliance with EMEP/ EMP

No.	Sub-Project Name	EMP/ EMEP Part of Contract Documents (Y/N)	EMEP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

III. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each subproject

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used

- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

IV. GRM Performance

Summary of complaints received, resolution and status

V. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

Summary of follow up time-bound actions to be taken within a set timeframe.

VI. APPENDIXES

Photos
Summary of consultations

Copies of environmental clearances and permits
Sample of environmental site inspection report
Others

Government of Nepal
MINISTRY OF URBAN DEVELOPMENT

Phone 4211693, 4211883, 4211673
Fax : 977-1-4211873

Singhadurbar,
Kathmandu, Nepal

Ref. No.:- 37

February 18, 2015

Mr. Fei Yue,
Director, Urban Development Division, SAUD
Asian Development Bank
1550, Metro Manila, Philippines

Subject: Loan No 2776– NEP (SF) Kathmandu Valley Water Supply Improvement Project (Additional Financing); Endorsement of the Safeguards & Due Diligence Documents.

"I, the undersigned, the Secretary of the Ministry of Urban Development (MOUD), hereby confirm that the MOUD gives its endorsement to the following Safeguards and Due Diligence documents for the additional financing to the Kathmandu Valley Water Supply Improvement Project.

- Initial Environmental Examination
- Environmental Assessment and Review Framework
- Resettlement Framework
- Due Diligence Report for BDS 4
- Resettlement Plan for DNI 7
- Resettlement Plan for DNI 8
- Due Diligence Report for BDS 2
- Due Diligence Report for small works package

Yours Sincerely,

.....
Arjun Kumar Karki
Secretary

CC:

Mr. Kenichi Yokoyama,
Country Director, ADB, NRM