Initial Environmental Examination

Document Stage: Final
Project Number: 35173-015
September 2019

NEP: Urban Water Supply and Sanitation (Sector) Project – Panchkhal Water Supply & Sanitation Project, Kavre District

Package No. W14

Prepared by Ministry of Water Supply, Government of Nepal for the Asian Development Bank.

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

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ABBREVIATIONS

A.D.	Anno Domini
ADB	Asian Development Bank
AM	Accountability Mechanism
BoQ	Bill of Quantities
B.S.	Bikram Sambat
CAPP	Community and Public Participation Plan
CBS	Central Bureau of Statistics
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
CO	Carbon Monooxide
CRO	Complaint Receiving Officer
CSA	Concerned Sector Agency
DCC	District Coordination Committee
DDR	Due Diligence Report
DEDR	Detailed Engineering Design Report
DHM	Department of Hydrology & Meteorology
DMA	District Metered Area
DMC	Developing Member Countries
DoR	Department of Roads
DRTAC	Design Review and Technical Audit Consultant
DSMC	Design, Supervision and Management Consultant
DWSSM	Department of Water Supply and Sewerage Management
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EO	Environmental Officer
EPA	Environment Protection Act
EPR	Environment Protection Rules
ERDSMC	Eastern Regional Design Supervision and Management Consultant
ES	Environmental Specialist
ESA	Environmental Safeguard Assistant
ESE	Environmental Safeguard Expert
GoN	Government of Nepal

GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HHs	Households
IBAT	Integrated Biodiversity Assessment Tool
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICG	Implementation Core Group
IEC	Information, Education and Communication
IED	Intelligent Electric Device
IUCN	International Union for Conservation of Nature
IEE	Initial Environmental Examination
LC	Least Concern
MoFE	Ministry of Forest and Environment
MoPE	Ministry of Population & Environment
MoWS	Ministry of Water Supply
MWSS	Manufacturer Waste Scrap Shingles
NAAQS	National Ambient Air Quality Standards
NDWQS	National Drinking Water Quality Standard
NEA	Nepal Electricity Authority
NEPAP	National Environment Policy & Action Plan
no.	Number
NO_2	Nitrogen Dioxide
NGO	Non-Governmental Organization
NRs	Nepalese Rupees
NTFP	Non-Timber Forest Products
NUDS	Nepal Urban Development Strategy
NVMES	Nepal Vehicles Mass Emission Standards
O&M	Operation and Maintenance
OBA	Output - Based Aid
ODF	Open Defecation Free
PE	Polyethylene
PID	Project Information Datasheet
PID	Proportional Integral Derivative
PLC	Programmable Logic Controller
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter 2.5 micrometers
PM_{10}	Particulate Matter 10 micrometers
PMO	Project Management Office

PMQAC	Project Management and Quality Assurance Consultants
PN	Pressure Number
PPHA	Persons Per Hectare
RDSMCs	Regional Design Supervision and Management Consultant
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RPMO	Regional Project Management Office
RTU	Remote Controller Unit
RVT	Reservoir Tank
SCADA	Supervisory Control and Data Acquisition
SDG	Sustainable Development Goal
SO_2	Sulphur Dioxide
SPS	Safeguard Policy Statement
SS	Site Specific
SSTWSSSP	Second Small Towns Water Supply and Sanitation Sector Project
STWSSSP	Small Towns' Water Supply and Sanitation Sector Project
TDF	Town Development Fund
ToR	Terms of Reference
TSTWSSSP	Third Small Town Water Supply & Sanitation Sector Project
UNICEF	United Nations International Children's Emergency Fund
UWSSSP	Urban Water Supply & Sanitation (Sector) Project
VDC	Village Development Committee
VU	Vulnerable
WHO	World Health Organization
WN	Ward Number
WSP	Water Safety Plan
WSSDO	Water Supply and Sanitation Divisional Office
WTP	Water Treatment Plant
WUA	Water Users' Association
WUSC	Water Users' and Sanitation Committee

WEIGHTS AND MEASURES

°C	Degree Celsius/centigrade
dBA	decibel audible
Ha	hectare/s
HP	Horse Power
Km	kilometer/s
Kph	kilometer/s per hour
Kph	kilometer/s per hour
lps	liter per second
m	meter/s
m^3	cubic meter/s
amsl	Above mean sea level
mg/l	milligram/s per liter
mm	millimeter/s
sq.km.	square kilometer

NOTES

This Initial Environmental Examination (draft) is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff and may be preliminary in nature. The draft IEE and its environmental management plans will be updated during project implementation.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

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EXECUTIVE SUMMARY

Introduction

Panchkhal Water Supply & Sanitation Project is one of the projects proposed under UWSSSP, which will will support Nepal in expanding access to community managed water supply & sanitationin 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by ADB. In support of GoN's endeavor, the Asian Development Bank (ADB) funded this Urban Water Supply and Sanitation (Sector) Project (UWSSSP). This project has the following outputs: i) Improved Water Supply and Sanitation Infrastructure in Project Municipalities and ii) Strengthened Institutional and Community Capacities

During field study, it has been identified that the existing water supply system is intermittent and is limited to only certain parts of the proposed area. Hence, the existing water supply system is not able to meet even the current demand of Panchkhal municipality. Similarly, there is no provision of treatment system in the existing water supply sytems of the proposed town. Considering the water demand and condition of the existing system, there is a need of the proposed project to upgrade the existing water supply situation within the proposed service area to meet the growing demand for private connections, to make drinking water available to the people of service area throughout the year and to provide easy access to safe & reliable water supply service.

As per the study, the proposed project area lies in Panchkhal Municipality, Kavre District, a hilly district in the Province 3 of Nepal. Out of 13 wards of the project town, the proposed project area covers partial areas of wards 2,3,4,6,7,8,9,10,11 & 12.

The IEE study has been carried out in accordance with the requirements of the ADB's Safeguard Policy Statement (SPS 2009) and environmental requirements of GoN i.e., EPA (1997) and EPR (1997 with amendments 1999, 2007 & 2017). The methodology adopted to carry out this IEE study involves;

a) Literature Review/ Desk Study: Relevant Maps & Reports including Feasibility Report, DEDR & DDR and other related published articles were reviewed to collect secondary information regarding the proposed project.

b) Impact Area Delineation: On the basis of literature review and field study, the Impact Area Delineation is carried out to determine the area of the project area affected by the proposed project activities.

c) Field Study: The field study was conducted to collect baseline information on physico-chemical, biological, and socio-economic conditions of the core and surroundings areas of the project town.

d) Stakeholder & Public Consultation: This has been carried out to acknowledge any kind of suggestions and to acquire the required information regarding the proposed project from the interested stakeholders. The information acquired was integrated in the identification of anticipated environmental impacts.

e) Impact Identification, Prediction & Evaluation Method: This method is carried out through simple checklist & questionnaire method and through professional judgement to determine adversity of the anticipated impacts. The study has followed the procedures outlined in the approved ToR and has covered the issues delineated therein.

Policy, Legal & Administrative Framework

The IEE study requires study of the concerned Policy, Legal & Administrative Framework to analyze their compliance with the project construction activities. The major environmental act, rules, plan, policies, guidelines that are relevant for IEE study of this project includes;

a) Major Law, Acts & Rules: i)Constitution of Nepal; ii) Environmental Protection Act (EPA), 2053 B.S. (1997 A.D); iii) Environmental Protection Rules (EPR), 1997 AD, and its amendments in 2017 A.D.

b) Plans, Policies & Strategies: i) National Environmental Policy & Action Plan (NEPAP), 2050B.S. (1993 A.D.); ii) Water Resources Strategy, 2059 B.S. (2002) A.D.; iii) Rural Water Supply and Sanitation Sectoral Strategic Action Plan (Unofficial Translation), 2060 B.S. (2004 A.D.); iv) Rural Water Supply and Sanitation National Policy and Rural Water Supply and Sanitation National Strategy, 2060 B.S. (2004 A.D.); v) National Water Plan, 2062 B.S. (2005 A.D.); vi) National Urban Policy, 2063 B.S. (2007 A.D.); vii) National Urban Water Supply & Sanitation Sector Policy, 2065 B.S. (2009 A.D.); viii) Updated 15-yr Development Plan for Small Towns Water Supply and Sanitation Sector, 2066 B.S. (2009 A.D. and Amendments in 2015A.D.); ix) National Water Supply & Sanitation Policy (Draft), 2071 B.S. (2014 A.D.);x) Land Acquisition, Rehabilitation and Resettlement Policy, 2015 A.D.; xi) Land Use Policy, 2072 B.S. (2015 A.D.); xii) National Urban Development Strategy, 2074 B.S. (2017 A.D.); xiii) National Forest Policy, 2075 B.S. (2019 A.D.); xiv) Fourteen Three

Years Plan (2073/74- 2075/76) and xv) Fifteenth Plan Approach Paper, 2076/77-2080/81

c) **Laws & Acts:** i) Essential Goods Protection Act; 2012 B.S. (1955 A.D.); ii) Aquatic Animal Protection Act, 2017 B.S. (1961 A.D.) with Amendments (2055 B.S. (1997 A.D.)); iii) Town Development Act , 2045 B.S. (1988 A.D.); iv) Water Resource Act, 2049 B.S. (1992 A.D.); v) Forest Act, 2049 B.S. (1993 A.D.) with amendments 2055 B.S. (1999 AD.); vi) Land Acquisition Act,2049 B.S. (1993 A.D.); vii) Child Labor Prohibition and Regulation Act, 2056 B.S. (2001 A.D.); viii) Water Supply Management Board Act, 2063 B.S. (2006 A.D.); ix) Solid Waste Management Act, 2068 B.S. (2011 A.D.); x) Labour Act, 2074 B.S. (2017 A.D.); and xi) Local Government Operation Act, 2074 B.S. (2017 A.D.); vii).

d) **Rules & Regulations:** i) Solid Waste (Management & Resource Mobilization) Rules, 2044 B.S. (1987 A.D.) & Amendments 2049 B.S. (1992 A.D.); ii) Water Resource Regulations, 2050 B.S. (1993 A.D.); iii) Forest Regulations, 2051 B.S. (1995 A.D.); iv) Drinking Water Regulations, 2055 B.S. (1998 A.D.); v) Solid Waste Management Rules, 2070 B.S. (2013 A.D.) and vi) Labor Rules, 2075 B.S. (2018 A.D.)

e) **Directives, Guidelines & Manuals:** i) National EIA Guidelines, 2049 B.S. (1993 A.D.); ii) WHO Air Quality Guidelines, Global Update, 2061 B.S. (2005 A.D.); iii) WHO Guidelines for Drinking-water Quality, Fourth Edition, 2073 B.S. (2017 A.D.); iv) National Noise Standard Guidelines, 2068 B.S. (2012 A.D.); v) Guidelines for Community Noise by WHO, 2055 B.S. (1999 A.D.) and vi) Working procedure for the use of national forest for national priority projects, 2074 B.S. (2017 A.D.)

All projects funded by the ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects funded under ADB loan are environmentally sound, legally compliant, and safe. On the environment, the ADB Operations Manual, Bank Policy (OM Section F1/OP, 2010), underpins the SPS 2009. ADB's Environmental Safeguards policy principles are defined in SPS (2009), Safeguard Requirements

Analysis of Alternatives

Analysis on the alternatives of the proposed project is another important process of IEE study that will help to assess the feasibility of the project in regard to technical, environmental & social aspects. Primarily, this involves two alternatives that includes "Without Project" or "Do-nothing" Alternative and "With Project" Alternative. The

limitation of "Without Project" Alternatives regarding continuous water supply system, treatment system and susceptibility to water borne diseases leads to opt for "With Project" Alternative. With Project Alternative has been analyzed by envisaging the likely benefits of the proposed project. The analysis shows that the proposed project is designed to provide convenient access to reliable, adequate, safe and potable water supply to 29,603 populations as per base year 2018 A.D.

This alternative analysis also shows that proposed project has been designed under two scenarios. The development of system alternatives in this proposed project has been done using alternate system layouts keeping other parameters constant. The analysis shows that there is no other reliable source nearby service area except Sunkoshi water source. Hence, Sunkoshi River is the only potential water source for the proposed project. Regarding the design, in both alternatives, the structures from WTP to the distribution network remain the same. The distribution network will be same for both options. The main difference between the proposed alternatives is the design of transmission pipe line. The alterntaive I involves use of Required Flow from Sunkoshi River by Pumping with Double Pipes and Supply Water to Distribution System by Eleven RVTs while the alternative II use of Required Flow from Sunkoshi River by Pumping with Single Pipes and Supply Water to Distribution System by Ten RVTs. Environmentally, they are not much different and both of the alternatives have no such environmental issues too. Socially, both alternatives are on equal footing. Financially, alternative II is slightly more economical than alternative I. However, if alternative II is selected for the proposed project, financially it may sound feasible but, technically the system may get failed as there is high possibility of interruption ot the water supply service under the condition of pipe damage in the future if any. Hence, alternative I is recommended for further study though the cost is slightly higher than alternative II.

Description of the Project

The project town covers partial wards of wards 2,3,4,6,7,8,9,10,11 & 12 of Panchkhal Municipality. The proposed project intends to provide both water supply as well as saniation service. Hence, it comprises comprises both water supply as well as sanitation components which are as follows:

i. Water Supply Components

a) Sources/ Intakes: The study shows that the only reliable source available within the project area is Sunkoshi River.The seepage water of the river will be tapped through the construction of Infiltration Gallery. The proposed

intake/sump well site is located at the right bank of Sunkoshi river at Bimiredobhan, which is about 2.5 km downstream of Dolalghat Bazaar (i.e. 2 km downstream of the confluence of Sunkoshi and Indrawati).

b) Electrical System: The proposed project has pumping station at each stage to reach water at WTP site. The overhead electrical transmission line will run along the pipe line route to supply power to each stage to run the pump. All the pumps at sump well, stage 2, stage 3 and stage 4 will be operated at a time to supply water at WTP/ storage reservoir. These pump stations are connected in series cascade mode. If one of the pumps fails to run due to any technical fault, the remaining pumps can deliver water from sump well to WTP/ storage reservoir.

c) Interruption Chamber/Break Pressure Tank: The proposed Break Pressure Tanks (BPTs) will be constructed at six locations that includes a) 50m^3 capacity along Branch Transmission Line, b) 10m^3 capacity along RVT-10 distribution system for Chisapani, c) 10m^3 capacity along RVT-10 distribution system for Gairigaun, d) 10m^3 capacity for RVT-9 distribution system, e) 2 nos -10m^3 capacity for Kharelthok distribution system.

d) Transmission Main & Pumping: The main transmission mains comprises three mains that includes a) Mains that goes to branch transmission by gravity; b) Mains that goes to Palanchowk Bhagwati by pumping and c) Mains that goes to Bhimsentahn WTP backwash RVT by pumping. The total pipe length of the main transmission from the proposed Sunkoshi river intake/ Sump well to the proposed treatment plant site/storage reservoir is about 9,135.00m including 5% more than the actual one, which comprises of DI pipe with Flanged End of diameter 200mm.There is also provision of two parallel pipes for water lifting purpose along the transmission mains to avoid the interruption of water supply service if one pipe need repair. The total branch transmission length i.e. from WTP/storage reservoir to 11 RVTs is 37,237.00 m including 10% more than the actual one having pipe size PE pipe (63-110) mm dia. and 5% more than the actual having pipe size DI 100mm to 250mm dia are used.

e) Thrust Blocks,Saddle Blocks and Thrust Beam: Typical thrust blocks have been designed for a pressure of 24 kg/sq cm for both transmission lines and distribution line. Similarly, theres is also provision of Thrust Beam & Saddle Blocks for DI pipes that will be laid up in sloppy areas and un-buried portions.

f) **Water Treatment Plant & Chlorination:** The proposed water treatment plant comprises of Baffle Channel Flocculator, Plain Sedimentation Tank and Rapid Sand Filter. There is also provision of backwash arrangement of rapid sand filter. A backwash reservoir (RVT-12) is provisioned and will supply water to Kharelthok RVT-11 by gravity and supply water to backwash the filter. Only one filter will be backwashed at at time at every 20-24 hours interval for 15 minutes by water. An emergency feeder line consisting of a solution tank connected with feeding tank having a constant level is proposed for the chlorination. FRP pump is used for this purpose. Bleaching powder 6.62kg / day and 9.65 kg / day require during base year and design year respectively.

g) **Sump Reservoir/Service Reservoir:** The distribution system has been designed by using multi-reservoir concept due to topography of the town which was also adopted in the existing system at various elevations. There is provision of sump RVT of 150m^3 capacity, each at pumping Stage 2, 3 & 4 and 1no of 400 m^3 capacity at WTP site. These reservoirs act as storage reservoirs. Similarly, there is also provision of backwash RVT of 150m^3 capacity that will also distribute water to Kharelthok RVT by gravity. There is also provision of eleven service reservoirs that include 6 no RVTs of 150 m^3 capacity at six locations (RVT 1-U/S Municipality, RVT 2-Anekot, RVT 3-Sashastra RVT, RVT 4-Bakhrel Dihi RVT, RVT 7-Jaretar and RVT 8-Shikharpur RVT), 3 nos RVT of 100 m^3 capacity at three locations (RVT 5-Radha Krishna School, RVT 6-Nayagaun RVT and RVT 10-Palanchowk RVT) and 2 nos. of 50m3 capacity at RVT-9(9N29) & RVT11-Kharelthok. The total storage requirement for the system at the end of the design period shall be about 2,300m^3.

h) **Distribution Main and District Metering Area:** The entire new distribution system has been designed by using GI, DI and PE-100 pipe. The minimum pipe size for the distribution mains used in the design is PE100- 50mm, which governs the velocity. The estimated distribution pipe is taken as 10% more than the actual one for PE pipe up to 90mm dia. and 5% more than the actual one for remaining all pipes is 189,309.00m. The design of this distribution system is based on the concept of District Metering Area (DMA). Each DMA will have bulk meter to determine the flow into respective service area. Each service reservoir is treated as one DMA. Hence, there are 11 DMAs within the proposed service area to supply water from each service reservoir.

i) **Household Connections:** The direct connection from main distribution pipe shall be made for the household connection. The average 15m length of 20mm dia. of PE 100-PN16 pipe with compression joint, joined with GI fittings and valves up to meter for each HH connection. There will be 5,998 taps in the system during base year. Two types of tap stands have been designed for the project. In total, there will be 9,312 connection including institutional 39 connections during design year.

j) **Appurtenances:** This consists of Bulkmeter, Wash out Valves, Air Valves, Check Valves,Control Valves, Pressure Relief Valves, SCAD Valves and Fire Hydrants.

k) **Valve Chambers:** Two type of Chambers have been proposed in the project to control or regulate the flow of the proposed water supply system. The chambers constructed by brick masonry have been provided in non-vehicular areas and rural area. In other vehicular carriageway and city area, chambers constructed with RCC has been provided. In total, there are 179nos. pipe valve boxes and 36 washout/ air release/ control valve chambers designed in the distribution system.

l) **Generator House:** A Generator house will be constructed at each pumping stage and WTP site. The Generator will supply power mainly for pumps installed at various stages of pumps, when there is no regular power from NEA. Two generators at stage each will pump 50% of the demand. If one generator gets out of order, only one generator will be operated and supply 25% of water.

m) **Laboratory Building cum WUSC Office Building, Guard House and Dosing House:** A two storeyed laboratory building cum WUSC office building has been designed and this has been proposed to be conctructed in Panchkhal Bazaar.There is provision of Small Guard House (G1) at each pumping stage (Stage 1 to 4), at Backwash RVT and at 11 service reservoir locations. Hence, in total, 16 small guard houses have been proposed. Similarly, one Medium Guard House (G2) have also been proposed at WTP site.

n) **Boundary Wall & Retaining Wall:** The retaining wall has been proposed at sumpwell site, stage 2,3,4 and WTP site and each reservoir site as necessary. In some case, boundary wall will be above retaining wall and some cases boundary will be from foundation.

ii. Sanitation Components

The survey revealed that there are not any public toilets or institutional toilets within the project town. Hence, the basic sanitation requirement of the proposed project is the construction of public toilets for institution as well as general public for the betterment of facilities in this area. There is provision of one institutional toilet & one public toilet under the sanitation components of this proposed project. This also involves provision of one tractor for solid waste collection which will promote awareness in disposing of solid waste properly and will control haphazard dumping of solid waste. These sanitation components will contribute towards the betterment of sanitation facilities in this area. These facilities also inculcate behavior of toilet use as well as of effective solid waste management among students and the general public. Hence, the proposed project also will address basic sanitation issues through the provision of toilets and solid waste management.

Description of the Environment

This IEE study requires information on the existing environment of the project town to identify the susceptibility of the environmental aspects of the project town towards the anticipated environmental impacts of the proposed project. Regarding this, the secondary information of the existing environment was collected through literature review during desk study. However, the secondary information is not sufficient for IEE study. Hence, the field study was carried out to collect primary information on the existing environmental aspects.

Regarding this, details on various physical environmental aspects like Landforms & Topography, Geology & Soil, Water Resources, Climate, Air Quality, Acoustic Environment and biological features like Flora, Fauna, Aquatic Life, Protected Areas & Community Forest Areas were collected through simple checklist, REA checklist, professional judgment and interaction with the locals & the concerned bodies during field study. No existence of protected areas within the project area was observed during the field study. However, the study shows that some portion of transmission mains pass through the community forest despite of which there is no requirement of cutting trees except clearance of some bushes.

During field study, details on the socio-economic environment that includes Demographic Features, Caste/Ethnic Groups, Economic Features, Education & Skills and Community Infrastructures were also collected through simple questionnaire method followed by household survey and interaction with the locals.

Anticipated Environmental Impacts and Mitigation Measures

The analysis on the information collected during field study helps to identify and predict the likely environmental impacts that may result from the proposed project. These predicted impacts are then evaluated using Scoring matrix as per National EIA Guidelines, 1993 to determine the nature, extent and magnitude. This evaluation will further help to propose the appropriate mitigation measure for each impact.

The anticipated environmental impacts have been mainly categorized into two viz., Beneficial Impacts and Adverse Impacts on the basis of its negative and positive significance. This has been further categorized into four impacts that includes i) Impact on Physical Environment, ii) Impact on Biological Environment, iii) Impact on Chemical Environment and iv) Impact on Socio-economic Environment, based upon the effects on the existing environment. These impacts has been sub divided into three categories based upon the project phase that includes i) Design Phase, ii) Construction Phase and iii) Operation Phase.

Here, Beneficial Impacts includes Employment Generation, Skill Enhancement, Local Trade & Business Opportunities, Improved Health & Hygiene, Increased Economic Opportunity and Social Empowerment. Similarly, Adverse Impacts includes Soil Erosion & Land Surface Disturbances, Spoil Disposal & Gully Erosion, Noise Pollution, Impacts on Air Quality, Surface Water Quality, Generation of Solid Waste & Waste water from the construction site & worker's camp, Accidental Leakage or Spillage of Stored Fuel/Chemicals, Land Use Pattern, Haphazard Disposal of Dismantled Debris, Impacts on Water Bodies, Impacts on Flora & Fauna, Impact on Aquatic Life, Impact on Water Quality of nearby rivers, Workers & Community Health & Safety Hazards, and Damage to the existing Utilities, Traffic Congestion, Public Protests, Disruption to Local Vendor's Business, Mobilization of Child Labour, Occupational Health & Safety Hazards, Delivery of Unsafe Water, Pollution in Newly Constructed Storm Water Drains, Blocking/Choking of Drains, Impact on Recipient Water Bodies and Impact of Sustainability of Works.

The mitigation & augmentation measures for each & every adverse as well as beneficial impacts mentioned above have been proposed. If these proposed mitigation measures are effectively implemented, no such significant environmental problems have to be encountered during the construction & operation period of the proposed project. Likewise, various suitable augmentation measures have also been proposed to to maximize the anticipated beneficial impacts.

Information Disclosure, Consultation & Participation

Stakeholder Consultation and Community Participation is an essential process in project preparation. It is the process of engaging stakeholders and affected people. This process involves Key Informant interviews, On-site discussions with WUSC, and Random Field Interviews of stakeholders. Prior to the stakeholder's consultation, stakeholder analysis and mapping of stakeholders were carried out to identify the potential stakeholders and their roles towards the implementation of the project. The potential stakeholders were then involved in consultation to disseminate information related to the project, to collect their views & suggestions and to prioritize their concerns regarding the project. This will continue throughout the implementation of the projects and operation period. To facilitate the stakeholder consultation, PMO & ICG will maintain good communication and collaboration with WUSC and the Municipality.

Grievance Redress Mechanism

The Project-specific grievance redress mechanism (GRM) is also an essential process of the IEE study which is meant for persons seeking satisfactory resolution to their complaints on the social and environmental performance of the projects under STWSSSP. The mechanism, developed in consultation with key stakeholders, will ensure the following mentioned points;

(i) the basic rights and interests of every person adversely affected by the social and environmental performance of a Project are protected; and

(ii) their concerns are effectively and timely addressed

This GRM involves setting up the Grievance Redress Committee (GRC) at the municipality level. The GRC will comprise of the following mentioned members:

(1) WUSC Secretary;

(2) RPMO Engineer;

(3) RPMO social /environmental (as relevant) officer,

(4) Representative of affected persons,

(5) RDSMC's safeguards specialist (social/environment as relevant),

(6) Representative of reputable and relevant CBO/SHG/organization working in the project area as invitee[1] , and

(7) Contractor's representative

[1] If the complaints are related with IP/Dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities shall be involved.

Environmental Management Plan

Preparation and Implementation of the environmental management plan (EMP) is another essential process of the IEE study.The main purpose of EMP is to ensure that the activities are undertaken in a responsible and non-detrimental manner. Similarly, the other objectives of EMP are as follows:

(i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site;
(ii) guiding and controlling the implementation of findings and recommendations of the environmental assignment conducted for the project;
(iii) detailing specific actions deemed necessary to assist in mitigating the environmental impacts of the project and in enhancing beneficial impacts; and
(iv) ensuring that safety recommendations are complied with.

The total estimated local level monitoring and mitigation cost for the project is NRs. 3,000,000.00.

Monitoring & Reporting

PMO & RPMO will be responsible for environmental monitoring & reporting. RPMO will monitor and measure the progress of EMP implementation. RPMO will submit a monthly monitoring and implementation reports to PMO, who will take follow-up actions, if necessary. PMO will submit semi-annual monitoring reports to ADB. ADB will review project performance against the MoWS's commitments as agreed in the legal documents. ADB will monitor projects on an ongoing basis until a project completion report is issued. Along with this, Ministry of Water Supply (MoWS) as well as Ministry of Forests & Environment (MoFS) under Government of Nepal will also undertake monitoring process through random field visits to review the project performance.

Conclusion

In conclusion, the IEE study shows that the proposed project is not an environmentally critical undertaking. The proposed project, its components, are not within or adjacent to environmentally sensitive areas. The few adverse impacts of high magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction periods). The proposed project will bring about the following mentioned benefits:

i) the benefits of easy access to reliable supply of safe and potable drinking water water;

ii) promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts; and

iii) enhanced community health, improved quality of life and safe communities as outcomes.

Hence, there are no significant negative impacts of the proposed project, and the classification of the project as Category "B" is confirmed as per ADB and as Schedule -1 is confirmed as per Environment Protection Rules, 2054 (1997) and 2017 (Latest Amendments). No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) and Environment Protection Rules, 2054 (1997) of Nepal.

I. INTRODUCTION

A. Name and Address of the Individual Institution Preparing the Report

i. Name of the Proposal

The Name of the Proposal is Panchkhal Water Supply & Sanitation Project

ii. Name and Address of the Proponent

The Project proponent, the Urban Water Supply and Sanitation (Sector) Project (UWSSSP) of the Department of Water Supply and Sewerage Management (DWSSM) is the proponent (Implementing Agency). The Ministry of Water Supply (MoWS), Government of Nepal, is the executive agency.

Name of Proponent

Project Management Office
Urban Water Supply and Sanitation (Sector) Project
Department of Water Supply and Sewerage Management
Ministry of Water Supply
Government of Nepal

Address of the Proponent:

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iii. Consultant Preparing the Report

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Website: www.taecconsult.com.np

B. Background

Prior to three prjects (STWSSSP), (SSTWSSSP) & TSTWSSSP, currently, ADB and GoN are working together to provide water supply and sanitation services to selected urban municipalities of Nepal through Urban Water Supply Sanitation (Sector) Project (UWSSSP) in accordance with the updated 15-year Development Plan for Small Towns and the National Urban Development Strategy. The Project will support Nepal in expanding access to community managed water supply & sanitationin 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by ADB. UWSSSP will be implemented over a five-year period (indicative implementation period is 2018 to 2023) and will be supported through ADB financing using a sector lending approach. This project has the following outputs: i) Improved Water Supply and Sanitation Infrastructure in Project Municipalities and ii) Strengthened Instittutional and Community Capacities.

Department of Water Supply and Sewerage Management (DWSSM) is the implementing agency whereas the Ministry of Water Supply is the executing agency. The project will assist in implementing a part of the 15-year Development Plan for Small Towns Water Supply and Sanitation Development in the country and about 20 Small Towns will be covered by this project.

In this context, the Eastern Regional Design Supervision and Management Consultants (ERDSMC), joint venture of TAEC Consultants P. Ltd. and Integrated Consultants Nepal (P.) Ltd. has been assigned to provide services on detailed design of seven towns namely; Birendranagar (Chitwan), Katahariya (Rauthat), Lalbandi (Sarlahi), Katari (Udaipur), Diktel (Khotang), Bhojpur Bazaar (Bhojpur) and Charikot (Dolakha) Town Projects. In addition, Ilam (Ilam), Brihat Bhanu (Tanahun), Panchkhal (Kavre), Kanchanrup (Saptari), Rampurtar (Okhaldhunga) and Deurali Hopse (Nawalpur) are assigned for the preparation of DEDR report.

The project has many stakeholders such as the WUSC, Project Management Office/ DWSSM, DRTAC, Town Development Fund (TDF), and Regional Design Supervision and Management Consultants (RDSMCs), RPMO. There is a need for effective co-ordination among the various stakeholders. In this context, the consulting team especially the major members of the Consultants' Team including the Team Leader, socio-economist and design engineer responsible for detailed design has been responsible for maintaining co-ordination with all the stakeholders involved in the project.

Both the GoN and ADB policies require that the environmental implications of individual developments needs to be taken into account in the planning and decision-making process, and that action is taken to reduce the adverse impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and Project development and implementation.

C. Project Area Description

The Project area of Panchkhal Water Supply & Sanitation Project lies in Panchkhal Municipality, Kavre District, a hilly district in the Province 3 of Nepal. The municipality lies between 27° 39' 00" Latitude and 85° 37' 00" Longitude. The project town lies in the west from the proposed water source Sunkoshi river.

The town is about 45km away towards east from the capital city, Kathmandu. Panchkhal Bazaar, the project site is linked at Dhulikhel with Barhabise and Kathmandu along Arniko Highway. The project has all-weather black topped road passes from the middle of the service. The internal road in the service are mostly gravel and earthen. A few kilometer road ie zero kilo to Palanchowk Bhagwati road has been black topped.

The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The mean monthly temperature is 24.9°C. The temperature ranges from 11.66°C to 24.9°C. The average mean annual rainfall is 1020 mm, which is slightly less than 1400 mm, the average precipitation of Nepal.

Hokse Bazaar, Zero Km, Anaekot, Deubhumi Baluwa, Sathighar Bhagwati are the local market centers in this area. This project town is famous for vegetables. The main cash crop of Panchkhal is Potato, Tomato, Chilly, Beans, Cauliflower, Paddy and other seasonal vegetables and food crops are Maize, Wheat etc.

The figure given below depicts the location of the proposed project area.

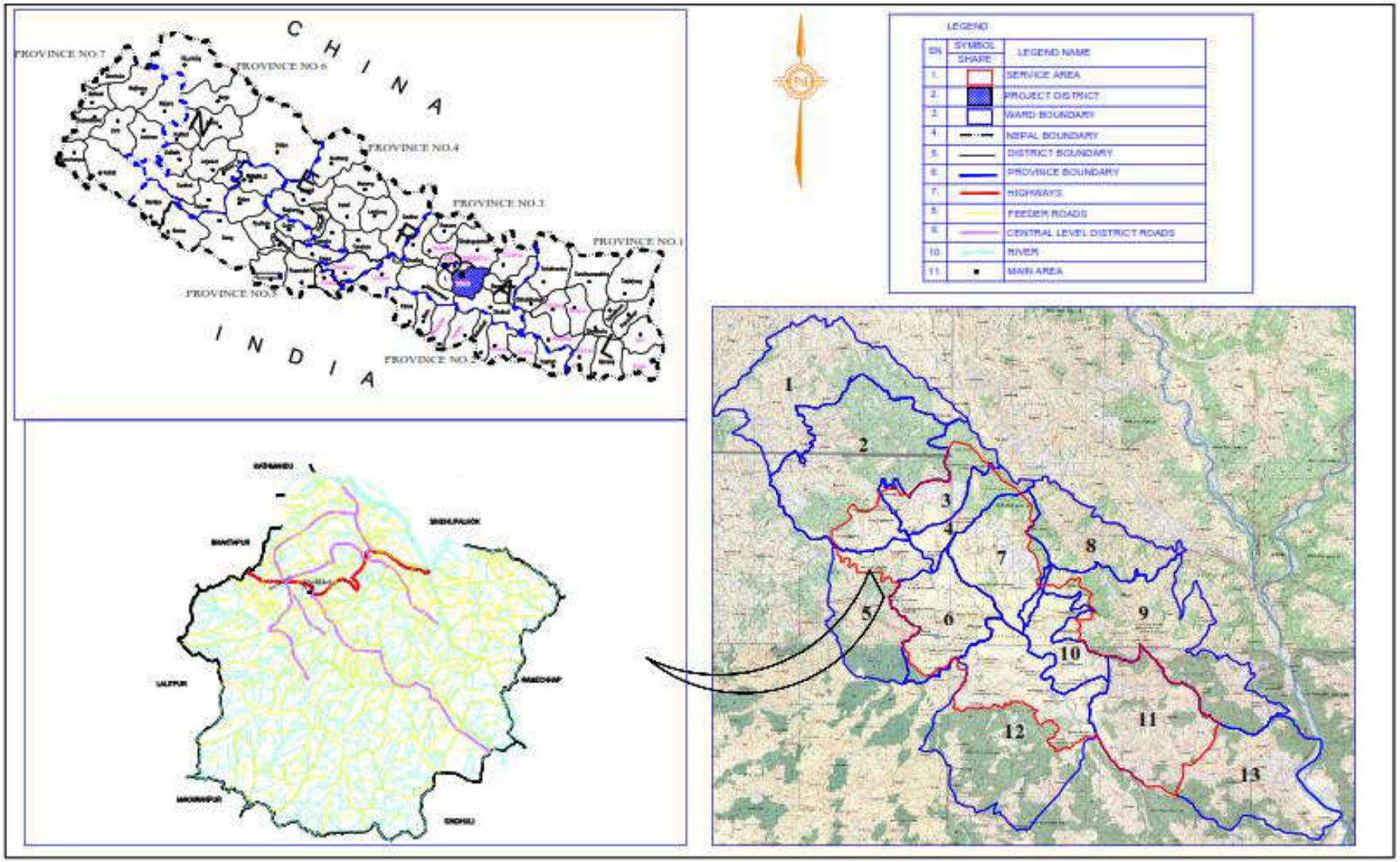

Figure 1: Location Map of the Project Area

This ***figure 1*** given above shows that the project area belongs to Panchkhal Municipality of Kavrepalanchowk District of Province 3 of Nepal. The project town is bounded by Mandandeupur Municipality in the north, Bhumlu Rural Municipality in the east, Temal Rural Municipality in the south east, Namobuddha Municipality in the south and Dhulikhel Municipality in the west. The project area lies in the west from the proposed water source Sunkoshi River. Out of 13 wards of the project town, the proposed project area covers partial areas of wards 2,3,4,6,7,8,9,10,11 & 12.

The project town was declared as Municipality by the Government of Nepal, Ministry of Federal Affairs and Local Development from Council of Ministers on May 8, 2014. The Panchkhal Valley, intermontane basin developed in the southeast of the Kathmandu Valley is located within the eastern flank of a synclinorium in Kavre District. At the time of the 2011 Nepal census, it had a population of 40061 & 8948 houses combining of the then VDC that were merged. The then VDC which were merged are Anaekot, Hokse Bazaar, Kharelthok, Koshidekha, Deubhumi Baluwa, Sathighar Bhwagawati & Panchkhal forming agriculturally rich Panchkhal Municipality. Later, again this newly formed municipality is merged with other two VDCs namely Kharelthok VDC & Koshidekha VDC to form a new Panchkhal Municipality with total of 13 wards covering area of 103 sq. km. According to 2011 Nepal census, the total population of this Panchkhal municipality is 37,997. The new administrative division of the proposed project town is given in the table given below:

Table 1: Panchkhal Municipality Ward Profile

Present Ward Municipality	Former VDC/Municipality	Former Ward No.
1	Panchkhal Municipality	WN 12 & 13
2	Panchkhal Municipality	WN 14 & 15
3	Panchkhal Municipality	WN 2
4	Panchkhal Municipality	WN 3
5	Panchkhal Municipality	WN 1
6	Panchkhal Municipality	WN 4 & 5
7	Panchkhal Municipality	WN 6
8	Panchkhal Municipality	WN 7 & 8
9	Panchkhal Municipality	WN 16 & 17
10	Panchkhal Municipality	WN 11
11	Kharelthok VDC	WN 1 to 9
12	Panchkhal Municipality	WN 9 & 10
13	Koshidekha VDC	WN 1-9

Source: Final District 1-75Corrected Last for Rajpatra (www.mofald.gov.np)

The ***Table 1*** above shows that the reformed Panchkhal municipality has been divided into 13 wards. The current wards (1-10) of Panchkhal Municipality belong to wards (1-8) & (12-15) of former Panchkhal municipality. Similarly, the current ward 11 belong to ward 1 to 9 of former Kharelthok VDC, ward 12 belong to wards 9 & 10 of the former Panchkhal Municipality and ward 13 belong to wards 1 to 9 of former Koshidekha VDC.

D. Purpose of the IEE

The main purpose of IEE is to ensure the environmental sustainability of the project, to integrate environmental considerations into the project preparation process and to manage the environment during project implementation. All projects funded by ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. The rapid environmental assessment using ADB's REA Checklist and Scoping Checklist has indicated that the Subproject is a Category B undertaking, requiring an IEE. On the GoN side, the statutory requirement that has to be adhered is the Environment Protection Act (1997), and Environment Protection Rules (1997 with Latest Amendments 2017). Based on EPR Schedule 1, the Subproject is within the threshold of activities under the water supply and sanitation sector that will require an IEE. This IEE fulfills the policy requirements of both ADB and GoN.

The IEE Report primarily:

i. Provides information on the Subproject and its environmental requirements;
ii. Provides the baseline physical, ecological, cultural and socioeconomic environments and resources in and surrounding the Subproject's area of influence;
iii. Identifies and assesses potential environmental impacts arising from the implementation of the Subproject;
iv. Recommends measures to avoid, mitigate, and compensate the adverse impacts;
v. Presents information on stakeholder consultations and participation during Subproject preparation
vi. Recommends a mechanism to address grievances
vii. Includes an environmental management plan.

E. Need for the Project

The existing water supply system is intermittent and is limited to only certain parts of the proposed area. Hence, the existing water supply system is not able to meet even the current demand of Panchkhal municipality. Similarly, there is no provision of treatment system in the existing water supply sytem of the proposed town.

Considering the water demand and condition of the existing system, there is a need of the proposed project to upgrade the existing water supply situation within the proposed service area to meet the growing demand for private connections, to make drinking water available to the people of service area throughout the year and to provide easy access to safe & reliable water supply service.

F. Rationale of the Project and IEE

Rationale of the Project

The rationale of the project is based on the increasing demand of the reliable project, hardship of people for safe drinking water, willingness to pay, affordability, public health impacts, policy committments and various other aspects.

Rationale of the IEE

The IEE study for the proposed project is needed to be studied from the environmental point of view as per EPA 1997 A.D. and EPR 1997 A.D., 2054 B.S. (Amendments 1999 A.D., 2007 A.D. and 2017 A.D.). The proposed project is intended to serve drinking water in wards 2 to 4 and 6 to 12. The project is expected to benefit a base year population of about 31,415 populations (2021) & a design year population of 45,768 (2040) by providing a reliable and adequate supply of safe & potable water and by promoting good hygiene and sanitation practices through provision of construction of public toilets.

As per EPR 1997(Amendments 1999, 2007 & 2017 AD), IEE for any project shall be done if the project meets the criteria mentioned in the Schedule 1 (Pertaining to Rule 3) (Clause H) for drinking water projects of EPR 1997(Amendments 1999, 2007 & 2017 AD), only an IEE should be done. The regulation stated in Schedule 1 (H) shall only be applicable if the proposal does not fall under the category "A" through (Clause H) of Schedule 2. Our study shows that the proposed project does not meet the criteria mentioned in Schedule 2 (Clause H) of EPR while the proposed project features meet the criteria mentioned in Schedule 1 (Clause H) of Environmental Protection Regulations 1997 with amendments 2017.

G. Methodology Adopted

The IEE study was carried out in accordance with the requirements of the ADB's Safeguard Policy Statement (SPS 2009) and environmental requirements of GoN i.e., EPA (1997) and EPR (1997 with amendments 1999, 2007 & 2017). The IEE study was conducted through preliminary exercise to solicit information from the planners, policy makers, concerned authorities, WUSC and the relevant stakeholders. This involves walkthrough survey, desk study, field visits and impact identification & evaluation. For this,The stepwise process to undertake these activities are as follows:

i. Literature Review/Desk Study

Available secondary information in the form of reports and maps; topographic maps, land use maps, aerial photographs, cadastral survey maps, etc. were collected and reviewed. Feasibility Study Report, Detailed Engineering Design Report and Due Diligence Report of the proposed project were the key documents to determine the nature and scope of activities of the project that influences the environmental conditions of the proposal area. Rainfall & Other Meteorological data of the project town were also collected from the Department of Hydrology & Meteorology. Similarly, published and unpublished reports about environmental policies, laws, rules, standards, Acts, Regulation and other legal provisions were also collected and reviewed. Published and unpublished literature of the project area about biological, social, chemical, physical, and cultural environments in the form of maps, and reports, etc. were collected from various sources and reviewed to get information on the coverage of the studies and fulfill the data gaps.

ii. Impact Area Delineation

To carry out IEE study, the possible areas where the anticipated impacts have either significant or insignificant effects, need to be delineated. To specify the area that would be covered by the assessment, the geographical boundary of the influence area is delineated on the topographical map. This delineating methodology is called Impact Area Delineation The impact areas have been delineated on the basis of proximity of the construction site to the nearby surrounding areas. The impact areas has been delineated as “Core Project Area”, and “Surrounding Project Area” on the basis of proximity and magnitude of the impacts due to the proposed project activities.

Core Area: Here, the Core Area indicates the area required permanently as well as temporarily for the proposed project. This area refers to the service area as well the area where the construction of the project components will be carried out.

Surrounding Area: Here, the Surrounding Area indicates the area within the immediate surroundings of the core area of proposed project. It includes the area of the project town which is closely associated with the core area of the project

iii. Field Study

Field studies were carried out within the project site areas in an extensive manner by a multidisciplinary team comprising a) an Environmental Specialist; b) Water Supply & Sanitation Engineer; c) Sociologist; d) Geo-hydrologist and e) Botanist. During the visit, baseline information on physico-chemical, biological, and socio-economic & cultural conditions of the core area and surrounding areas of the project area were collected through simple checklist method and Survey Questionnaire method. During field study, Rapid Environmental Assessment (REA) Checklist (***Refer Annex A***) as recommended by ADB as per SPS, 2009 were duly followed and filled up. This checklist primarily includes the data regarding physico-chemical, biological, socio-economic & cultural environment. Various approaches and methodological tools that were used for the data collection of various environmental aspects during this field study are described below:

a) Physico-Chemical Environment

An extensive physical & chemical environment survey were carried out by delineating the project impact area to collect the baseline information. Topographic and geomorphological features that include Landforms, Geology & Soil, Land use pattern, Landslide susceptibility etc. were observed and documented. The data regarding Climate & Rainfall of the project town were collected from the concerned authority. Similarly, information on air quality and noise quality condition were collected through field observation and expert's judgment. Information on rivers and aquatic ecology were also collected to assess the existing condition. Various consultations programs with the local communities and Interviews with few government officials, schools & representatives of the local bodies were also conducted.

b) Biological Environment

The baseline information regarding biological environment were collected through walkthrough survey throughout the core & surrounding areas of the project area by adopting simple checklist method (***Refer Annex A***), through professional judgment

and local interaction. Under this baseline information in regard to the biological environment, types of vegetation and forests were identified based on the species composition. The protected vegetation (rare, endangered, indigenous, etc.) of the project area as per IUCN Red Book, CITES Appendices, IBAT Report generated by ADB and GoN list species were enumerated based on consultation with the local people and the expert judgment.

Information on rivers of the project area and aquatic ecology were also collected through the interaction with the locals, the expert judgment and field observation.

The data on the existing wildlife/mammals, birds, herpetofauna (Reptiles/Amphibians) were collected through field observation and interaction with the locals. The checklists as given in ***Annex A*** were filled up accordingly. The status of each of these species were identified as either threatened or near threatened or endangered species or least concern as per IUCN Red Book, IBAT Report of ADB, CITES Appendices and GoN list species. This were affirmed by the expert review.

c) Socio-Economic & Cultural Environment

Household surveys were conducted through interviews by simple questionnaire method to obtain information on the socio-economic & cultural environment that primarily includes demography, ethnicity, education, health & sanitation, drinking water condition of the project area, irrigation facility, local traditions, religions, land use patterns, incomes & expenditures and to acquire their perception towards the proposed project, etc. Information on Migratory patterns of the local people and the Impact of river on settlements & agriculture were collected. Information on the people residing within the core area of the proposed project town were collected through socio-economic survey. The sample of Household Survey Questionnaire that were filled up during household survey has been included in ***Annex A.***

Focused Group discussions (FGD) were conducted to obtain suggestions and comments from all the potential stakeholders. Direct observation (Transect Walk Method) were conducted to ascertain the existence of the cultural sites, and public institutions such as temples, cremation grounds, historical & archaeological sites, schools, and health posts within the project core areas and to determine the effect on their existence due to project construction activities. The Consultations with the village elites, Meetings and Group discussions were done to assess the current situation of the project area community.

iv. Stakeholder & Public Consultation

Various consultations with key stakeholders were held during design phase of this proposed project. Here, the key stakeholders include government agencies, local bodies, road users, local beneficiaries etc. These consultation programs disclose information regarding the proposed project to the relevant stakeholders. Along with this, other required information for the project were collected from the concerned stakeholders, which were integrated in the identification of anticipated environmental impacts.

v. Impact Identification, Prediction & Evaluation Methods

The information regarding Physico-chemical, Biological and Socio-economic & Cultural aspects as mentioned above were collected to identify the susceptibility of these aspects to be affected by the proposed project activities. This helped to identify the anticipated environmental impacts of the proposed project. For this, Simple Checklist method were adopted for the impact identification. This was carried out by using Rapid Environmental Assessment (REA) Checklist prepared by ADB and by using simple household survey questionnaire (***Refer Annex A***) prepared during the desk study. These checklists explained about the environmental features or factors that need to be addressed while identifying the impacts of projects and activities.

Once all the important impacts were identified, their potential characteristic were predicted. The baseline data on physico-chemical, biological, socio-economic and cultural aspects were used to estimate the likely characteristics and parameters of impacts that includes Nature, Magnitude, Extent and Duration.

The nature of each predicted impact has been classified into Direct (D) and Indirect (ID). The magnitude of the impact is classified into High (H), Medium (M) and Low (L). The extent is classified into Site-Specific (SS), Local (L), and Regional (R). Similarly, the duration of impact is classified into Short Term (ST), Medium term (MT), and Long term (LT).

Impact predictions is generally made against a baseline established by the existing environment. Hence, during our field study, the baseline data were used as reference point against which the characteristics and parameters of impact related changes were analyzed. Impact predictions were made by considering the future state of the environment. This also requires professional judgment for accuracy.

After the impact identification and prediction method, the impacts will be evaluated regarding the significance of the predicted impacts to assess the adversity of adverse impacts and efficiency of beneficial impacts within the project core & surrounding areas. This was done by following the *National EIA Guidelines 1993* according to which scoring for each likely parameter of the impacts was carried out and the level of significance has been assessed as recommended by these guidelines.The scoring of Impacts as per *National EIA Guidelines 1993* is tabulated below*:*

Table 2: Scoring of Impacts

S. No.	Likely Parameters of Impacts	Type	Scoring as per National EIA Guidelines,1993
1.	Nature	Direct	No Scoring Required
		Indirect	
2.	Magnitude	High (H)	60
		Medium/Moderate (M)	20
		Low (L)	10
3.	Extent	Regional (R)	60
		Local (L)	20
		Site Specisifc (SS)	10
4.	Duration	Long Term (LT)	20
		Medium Term (MT)	10
		Short Term (ST)	5

Source: National EIA Guidelines 1993

Then, the significance level of Impact rated will be assessed as per the following table:

Table 3: Significance of Impacts

S. No.	Scoring as per National EIA Guidelines,1993	Level of Significance as per National EIA Guidelines,1993
1.	Less than 50	Insignificant
2.	50 to 75	Significant
3.	More than 75	Very Significant

Source: National EIA Guidelines 1993

This evaluation has been carried out as per the professional judgment by the key expert team involved in the IEE study.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The IEE study has followed the necessary policy, legal and adminstrative framework outlined in the approved ToR. However, some of them mentioned in ToR are updated in this IEE study.

A. Nepal's Environmental Policy, Legal & Administrative Framework

Constitution of Nepal

The Constitution of Nepal is the fundamental law of Nepal.

- Article 30 (1) of the Constitution of Nepal guarantees a ''clean environment'' as a fundamental right, and elaborates that ''every citizen shall have the right to live in a clean and healthy environment".

- Article 30 (3) of the constitution also encourages the state to formulate necessary legal frameworks to balance environment and development.

Beside this, the Government of Nepal has passed a series of environmental laws, policies and implementing regulations and standards. Among these, the basic legislations that provide the framework within which environmental assessment is carried out in Nepal are the:

Environmental Protection Act, 2053 (1997)

- Environmental Protection Act (EPA), 1997, which requires a proponent to undertake IEE or EIA of the proposed project and have the IEE or EIA Report approved by the concerned sector agency, respectively, prior to implementation. This EPA:

(i) sets out the review and approval process of IEE and EIA Reports, that involve informing and consulting stakeholders;

(ii) stipulates that no one is to create pollution that would cause significant adverse impacts on the environment or harm to public life and health, or to generate pollution beyond the prescribed standards;

(iii) specifies for the Ministry in charge of environment (currently the MoFE) to conduct inspection of approved projects to ensure that pollution prevention, control or mitigation is carried out according to the approved IEE or EIA Report;

(iv) provides for the protection of objects and places of national heritage and places with rare plants, wildlife and biological diversity; and

(v) states that any person/party affected by pollution or adverse environmental impact caused by anybody may apply to the prescribed authority for compensation to be recovered from the polluter/pollution generator.

Environmental Protection Rules, 2054(1997)

Environmental Protection Rules (EPR), 1997, and its amendments in 1999, 2007 & 2017 defines the implementing rule and regulations of the IEE/EIA process, elaborating the provisions in the EPA. The preparation, review and approval of IEE and EIA Reports are dealt with in Rules 3 to 7 and 10 to 14. Schedules 1 and 2 list down the projects of activities that are required IEE and EIA, respectively, as amended in 2017.

Other environmental policies, laws, rules, conventions & standards of Nepal that provide general context in the environmental assessment of water supply & sanitation works are presented in ***Table 4***.

Table 4:Other Relevant Environmental Act, Rules, Plan, Policies, and Guidelines of Nepal

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
i) Plans, Policies & Strategies			
National Environmental Policy & Action Plan (NEPAP)	2050B.S. (1993 A.D.)	Of its five objectives, most relevant to the Project are to (i) mitigate adverse environmental impacts; and (ii) safeguard national & cultural heritage & preserve biodiversity, within & outside protected areas.	• The subproject will not encroach any physical & cultural heritage areas and will not affect biodiversity. • EMP provides measures to mitigate anticipated adverse impacts.
Water Resources Strategy	2059 B.S. (2002 A.D.)	Among the ten strategic outputs of this strategy, third output focuses on Adequate Supply of and access to potable water and sanitation & hygiene awareness provided.	This provision will strengthen implementation capacity for the proposed project.
Rural Water Supply and Sanitation Sectoral Strategic Action Plan (Unofficial Translation)	2060 B.S. (2004 A.D.)	• This action plan has proposed "Environmental Aspects" as one of its major components. • This underscores the environmental aspects of all levels of plans and their implementation and consolidates them according to rules & policies to ensure the execution of development works.	Though this action plan has main focus on rural areas and the proposed project is for urban area, the IEE study has duly followed this strategic action plan as a reference.
Rural Water Supply and Sanitation National Policy and Rural Water Supply and Sanitation National Strategy	2060 B.S. (2004 A.D.)	Recognizes that all people have a right to access to basic water supply and sanitation services and that these services are necessary for socio economic development and to combat waterborne diseases	The proposed project ensures easy access to safe, reliable & potable water.
National Water Plan	2062 B.S. (2005 A.D.)	• This includes subsector-wise action programmes in water induced disasters, environmental action plan on management of watershed and aquatic ecosystem, water supply, sanitation and hygiene, irrigation for agriculture, hydropower development, industries, tourism, fisheries, and navigational uses, water-related information systems (Decision Support System for River Basin Planning and Management), legal frameworks, and institutional mechanisms • This also includes Environment Management Plan, a strategic document for the implementation of environmental protection measures (including downstream water pollution and groundwater quality,	This has been considered in IEE study

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		erosion/landslide and sedimentation, water pollution and sanitation, effect on aquatic life and wetland ecosystem), monitoring (baseline, impacts, and compliance), environmental auditing and institutional and procedural arrangements.	
National Urban Policy	2063 B.S. (2007 A.D.)	The policy gives importance to environment conservation while carrying out urban development works and natural resource use; thus, supporting the required environmental conservation and protection in donor-assisted development projects.	The IEE study will meet the provisions of this policy.
National Urban Water Supply & Sanitation Sector Policy,	2065 B.S. (2009 A.D.)	The Policy requires the IEE or EIA of proposed WSS projects by the EPA/EPR to (i) incorporate consultations with key stakeholders, including endpoint users; & (ii) specify measures to mitigate environmental impacts before, during construction & operation, as well as corrective measures.	The IEE study will meet the provisions of this policy.
Updated 15-yr Development Plan for Small Towns Water Supply and Sanitation Sector	2066 B.S. (2009 A.D. and Amendments in 2015 A.D	The Plan emphasizes monitoring and evaluation as an important component of a project to determine the overall impact of a project.	EMP prescribes performance monitoring & evaluation to minimize the anticipated environmental impacts.
National Water Supply & Sanitation Policy (Draft)	2071 B.S. (2014 A.D.)	One of the main objectives of this policy is to reduce urban and rural poverty by ensuring equitable socio-economic development, improving health and the quality of life of the people and protection of environment through the provision of sustainable water supply & sanitation service	The proposed project is also committed to provide safe, potable, reliable and adequate water supply service and to provide sanitation service through construction of public toilets.
Land Acquisition, Rehabilitation and Resettlement Policy	2015	• Contribute to overall development of the nation and its citizens by creating a conducive environment for implementation of infrastructure development projects • Facilitate timely execution (completion) of development projects by minimizing adverse impacts on economic, social and cultural aspects of affected families/people and the project area • Improve social and economic status of project-affected families by providing fair and adequate compensation, appropriate resettlement and rehabilitation assistances/	There is no issue of any kind of Land Acquisition, Rehabilitation and Resettlement in this project.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		allowances.	
Land Use Policy	2072 B.S. (2015 A.D.)	• The strategy 3 of Policy 2 has taken into account to maintain a balance between physical infrastructure development and environment. • The strategy 3 of Policy 10 focusses on adoption of principle of sustainable development in view of the impact of climate change during any construction and/or development works in order to keep balance between land, environment and development.	The proposed project will maintain balance between construction activities and environmental aspects of the project town.
National Urban Development Strategy	2074 B.S. (2017 A.D.)	• This strategy assesses the existing conditions of infrastructures, environment, economy and governance, establishes benchmarks and desirable standards. • It identifies prioritized strategic initiatives for investment in infrastructure and environment to realize the comparative advantages of urban areas.	The IEE study has duly followed this.
National Forest Policy	2075 B.S. (2019 A.D.)	It guides sub sectoral programmes relating to forests, plant resources, wildlife, biodiversity, medicinal plants, and soil and watershed conservation. It also covers periodic assessment and updating of information on forest resources of the country.	The proposed project does not have to deal with forest related adverse issues.
Fourteenth Plan (FY 2073/74-2075/76)	2073/74-2075/76	This plan has separate provision for water supply & sanitation sector. Regarding this, this plan intends to provide water supply & sanitation service to whole population for which it has its own strategy, working policy and expected positive outcomes through various development works in the field of water supply & sanitation service.	This proposed project falls under the major programmes of this plan. (Chapter 4, Section 3, Sub Section 3.6, Ka-2)
Fifteenth Plan Approach Paper (2076/77-2080/81)	2076/77-2080/81	This plan also has separate provision for water supply & sanitation sector. Regarding this sector, this plan aims to ensure access to safe water supply & sanitation service and to enhance quality service. This plan has also its own strategy, working policy and expected positive outcomes through various development works in the field of water supply & sanitation service.	The successful implementation of the proposed project shall be the expected outcome of this plan.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
ii) Laws & Acts			
Essential Goods Protection Act	2012 B.S. (1955 A.D.)	• Deems drinking water an essential commodity and strictly protects drinking water. • Prohibits any unauthorized use or misuse, stealing, damaging etc. of drinking water.	The proposed project ensures safe, reliable & potable water along with the provision of protection works and metering system to prevent any misuses, stealing and damage problems.
Aquatic Animal Protection Act	2017 B.S. (1961 A.D.) with Amendments (2055 B.S. (1997 A.D.))	This act renders punishment to any party introducing poisonous, noxious or explosive materials into a water source or destroying any dam, bridge or water system with the intent of catching or killing aquatic life. It also emphasizes that GoN empowers to prohibit catching, killing and harming of certain kinds of aquatic animals by notification in Nepal Gazette.	Information of this act will be delivered to the construction workers, as they may get involved in fishing during construction period.
Town Development Act	2045 B.S. (1988 A.D.)	This act has provision of services and facilities like road, transport, electricity, drainage, sanitation and open space based on density of such area.	The proposed project is solely for provision of water supply & sanitation services.
Water Resource Act	2049 B.S. (1992 A.D.)	• The umbrella Act governing water resource management. • Provides for the formation of water user associations and establishes a system of licensing. • Prohibits water pollution	WUSC has been formed for this proposed project as per this act and There is provision of control of water pollution through protection works and strict supervision.
Forest Act	2049 B.S. (1993 A.D.) with Amendments - 2055 B.S. (1999 A.D.)	The Act prohibits the extraction of boulders, rocks, pebbles, sand or soil from national forests, defined as all forests, excluding private forests, whether marked or unmarked with forest boundary, to include waste or uncultivated lands, or unregistered lands surrounded by the forest or situated near adjacent forests as well as paths, streams rivers, lakes, riverine lands within the forest.	No trees will be cut. EMP stipulates no quarrying of natural aggregate materials.
Land Acquisition Act	2049 B.S. (1993 A.D.)	It guides the compulsory acquisition of land. It also describes that GoN can acquire land at any place and in any quantity by giving compensation pursuant to the act for the land acquired for any public purposes or for operation of any development project initiated by GoN.	There is no requirement of land acquisition of private land. All the land required are under the ownership of GoN.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
Child Labor Prohibition and Regulation Act	2056 B.S. (2001 A.D.)	The section 3 of the Act prohibits a child from engaging in work, sub-clause 1 of the clause 3 states "Nobody shall engage in work a child who has not completed fourteen years of age as a labor and sub clause 2 states "Nobody shall engage a child in a risk full occupation or work set forth in the Schedule". The section 4 states "Child not to be engaged in work against his will by temptation or fear or pressure or by any other means.	This provision has been stated in EMP.
Water Supply Management Board Act	2063 B.S. (2006 A.D.)	It guides to prevents the misuse of potable water and prevent pollution of potable water	The proposed project has followed this as it has provision of protection works at the intake site, WTP & RVT sites that will prevent pollution of water.
Solid Waste Management Act	2068 B.S. (2011 A.D.)	Article 4 provides that the management of hazardous, medical, chemical or industrial waste rests upon the generators of such wastes. Management should be as prescribed in the Act. Article 5 provides that individuals and entities must reduce the amount of solid waste generated while carrying out work or business.	EMP prescribes eco-friendly management of solid and hazardous wastes.
Labor Act	2074 B.S. (2017 A.D.)	• The has provisions for the rights, interest, facilities and safety of workers and employees working in enterprises of various sectors. • The Act emphasizes on occupational health and safety of workers and stipulates provision of necessary safety gears and adopting appropriate precautionary measures against potentially hazardous machine/equipment in the workplace. • It also specifies to arrange such as removal of waste accumulated during production process and prevention of dust, fume, vapor and other waste materials, which adversely affect the health of workers. • It specifies the provision of controlling the communicable diseases at the construction site. It also prohibits mobilization of child as a labor. It emphasizes on the provision of temporary camp, safe drinking water and necessary food supplies to the workers.	These provisions are stated in EMP.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
Local Government Operation Act	2074 B.S. (2017 A.D.)	The Act gives Province Government the functions, duties & powers to: (i) entrust municipalities with responsibility of WSS services, (ii) conserve & protect their local environment & natural resources; (iii) plan, implement &/or operate & maintain WS projects at local level; (iv) implement or arrange for implementation local sanitation/sewerage & drainage projects; (v) protect cultural heritage & religious sites; &/or (vi) monitor project activities within their respective jurisdictions	Provides a basis for Local Government to monitor the environmental performance of the projects EMP provides the responsibilities of LGs in EMP implementation.
iii) Rules & Regulations			
Solid Waste (Management & Resource Mobilization), Rules	2044 B.S. (1987 A.D.) & Amendments 2049 B.S. (1992A.D.)	• This act focuses on the management of solid waste and mobilization of resources related. • These also ensure the health convenience of the common people by controlling the adverse impact on pollution from solid waste.	• This act needs to be reviewed during construction phase. • EMP covers the requirement of this rule for the proposed project.
Water Resource Regulations	2050 B.S. (1993 A.D.)	• This is the umbrella Regulation governing water resource management. • Sets out the procedure to register a Water User Association and to obtain a license • Sets out the rights and obligations of Water User Associations and license holders	The proposed project has followed these provisions.
Forest Regulations	2051 B.S. (1995 A.D.)	• This has separate provision for the protection of Community Forest along with the duties & responsibilities of Community Forest User's Group.	The proposed transmission mains run along the Naule Commununity Forests. The IEE study has considered this forest regulation assuring the protection of the Naule Community Forest.
Drinking Water Regulations	2055 B.S. (1998 A.D.)	• Regulates the use of drinking water • Provides for the formation of Drinking Water User Associations and sets out the procedure for registration. • Deals with licensing of use drinking water. • Deals with the control of water pollution and maintenance of quality standards for drinking water • Sets out the conditions of service utilization by consumers	The proposed project has followed all these provisions.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
Solid Waste Management Rules	2070 B.S. (2013 A.D.)	• GoN has issued these rules by exercising the power conferred by the section 50 of the Solid Waste Management Act, 2068. • Section 3 of this rule focuses on Segregation & management of solid wastes.	EMP for this proposed project covers this matter focused by this rule.
Labor Rules	2075 B.S. (2018 A.D.)	• GoN has issued these rules by exercising the power conferred to it under the section 184 of the Labor Act, 2074. • Section 7 of these rules deals with Occupational Safety & Health Policy.	EMP for this proposed project covers this matter focused by this rule.
iv) Directives, Guidelines & Manuals			
National EIA Guidelines	2049 B.S. (1993 A.D.)	This guidelines aims to assess the environmental impacts likely to be caused by a project, and promote its positive impacts and mitigate or eliminate adverse impacts by undertaking preventive and other effective measures after integrating the environmental impacts in the planning cycle of all the projects to be initiated in Nepal, prior to their initiation, so as to make the economic benefits from development projects sustainable	This has been followed for evaluation of the anticipated environmental impacts.
WHO Air Quality Guidelines, Global Update	2061 B.S. (2005 A.D.)	It provides basis for global standards in air quality that are designed to offer guidance in reducing the health impacts of air pollution.	During air quality monitoring, this guideline will be followed
WHO Guidelines for Drinking-water Quality, Fourth Edition	2073 B.S. (2017 A.D.	It provides the recommendation of WHO for managing the risk from hazards that may compromise the safety of drinking water.	During water quality monitoring, this guideline will be considered and followed
National Noise Standard Guidelines	2068 B.S. (2012 A.D.)	It provides basis for national standards in noise quality that are designed to offer guidance in reducing the health impacts of noise pollution.	During noise quality monitoring, this guideline will be followed
Guidelines for Community Noise by WHO	2055 B.S. (1999 A.D.)	It provides basis for global standards in noise quality at community level that are designed to offer guidance in reducing the health impacts of noise pollution.	During noise quality monitoring, this guideline will be followed.
Working procedure for the use of national forest for national priority projects, 2074	2074 B.S. (2017 A.D.)	It emphasizes on the management regarding the use of national /community forests for the implementation of national priority project.	During construction activities within the community forest area, this will be followed

Source: IEE Study, 2018/019

B. Environmental Agreements

International Environmental Agreements

Nepal is a signatory to many international agreements and conventions related to environmental conservation. However, all of those conventions are not interrelated to the proposed project. The conventions related to the proposed project are as follows:

(i) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
(ii) International Covenant on Economic, Social and Cultural Rights (ICESCR), 1976
(iii) Worst Forms of Child Labour Convention, 1999

The relevance of the aforementioned environmental agreements to the Subproject are with their emphasis on human activities to (i) take measures to protect local, as well as global, natural resources and environment; (ii) prevent or reduce the causes of climate change; and (iii) anticipate and mitigate the adverse impacts of climate change. The country is also committed to the Millennium Development Goals, the seventh goal of which is to "ensure environmental sustainability" targeting the reverse of loss of forest and environmental resources, reduction of biodiversity loss, and increase in the proportion of the population with sustainable access to safe drinking water and basic sanitation.

The Panchkhal Water Supply & Sanitation Project does not and will not break or go against Nepal's commitment to these international agreements.

C. Environmental Standards

The key environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are listed below and their details featured as ***Annex B***:

- National Ambient Air Quality Standards, for Nepal (NAAQS), 2003 A.D. & Updated in 2012 A.D.
- National Diesel Generator Emission Standard,2012
- Nepal Vehicle Mass Emission Standard, (NVMES), 2069 B.S. (2012 A.D.)
- The relevant environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are listed in ***Table 5*** and their details on the acceptable level criteria of these standards are featured in ***Annex B***.

Table 5: Relevant Environmental Quality Standards

Particular	National Standard	International Standard
Ambient air quality	National Ambient Air Quality Standards, for Nepal, 2003	WHO Air Quality Guidelines, Global Update, 2005
Noise	National Noise Standard Guidelines, 2012	WHO Noise Level Guidelines
Drinking water quality	National Drinking Water Quality Standards, 2005	WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011
Emission standard for diesel generator discharge to ambient Air	National Diesel Generator Emission Standard,2012	

Source: IEE Study, 2018/019

As shown in the above table, *National Ambient Air Quality Standards, for Nepal, 2003* is enforced by GoN that has set quality standards for seven parameters TSP, PM_{10}, Sulphur Dioxide(SO_2), Nitrogen Oxide(NO_2), Carbon Mono-oxide (CO), Lead (Pb) and Benzene at national level. Similarly, *WHO Air Quality Guidelines, Global Update, 2005* enforced by WHO has set quality standards for four parameters PM_{10}, $PM_{2.5}$, SO_2 and NO_2 at international level. Both standards provide guidelines to follow and comply the set standards for the ambient air quality during construction period. The acceptable level criteria for ambient air quality as per both standards are tabulated below:

Table 6: Standards for Ambient Air Quality

Parameter	Averaging Period	Nepal's Ambient Air Quality Standard (µg/m³) *	WHO Air Quality Guidelines (µg/m³) **	
			Global Update 2005	Second Edition ^ 2000
TSP	Annual	-	-	-
	24-hour	230	-	-
PM_{10}	Annual	-	20	-
	24-hour	120	50	-
$PM_{2.5}$	1-year	-	10	-
	24-hour	-	25	-
SO_2	Annual	50	-	
	24-hour	70	20	-
	10-minute	-	500	-
NO_2	1-year	40	40	-
	24-hour	80	-	-
	1-hour	-	200	-
CO	8-hour	10,000	-	10,000
	15-minute	100,000	-	100,000
Pb	1-year	0.5	-	0.5
Benzene	1-year	20	-	-

Source:

* National Ambient Air Quality Standards for Nepal, 2003. Obtained from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.
** Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.
^ Air Quality Guidelines for Europe, Second Edition, 2000. WHO Regional Office for Europe, Copenhagen.
Parameter that either has no national standard value for 24-hour observation or with WHO guideline value for 24-hour observation as more stringent than that specified in the national standards

Similarly, *National Noise Standard Guidelines, 2012* has set the standard noise levels measured in dBA for Inustrial area, Commercial Area, Rural Residential Area, Urban Residential Area, Mixed Residential Area and Quiet Area. This also has provision of standard values for the noise level generated by Water Pumps and Diesel Generator also. This is limited within the country only. For international level, *WHO Noise Level Guidelines* has set the standard noise levels measured in dBA for two areas that includes residential and commercial areas. The standard values for ambient noise quality are given in the table given below:

Table 7: Standards for Ambient Noise Quality

Receptor / Source	National Noise Standard Guidelines, 2012 (dB)		WHO Guideline Values for Noise Levels Measured Out of Doors * (One Hour L_{Aeq} in dBA)	
	Day	Night	07:00 - 22:00	22:00 - 07:00
Industrial area	75	70	70	70
Commercial area	65	55		
Rural residential area	45	40	55	45
Urban residential area	55	50		
Mixed residential area	63	55		
Quiet area	50	40	-	-
Water pump	65		-	
Diesel generator	90		-	

* Guidelines for Community Noise, WHO, 1999.

Source: Environmental, Health and Safety General Guidelines, 2007.International Finance Corporation, World Bank Group.

National Diesel Generator Emission Standard,2012 has been introduced by the Government of Nepal in 2012 for new and in use diesel generators with a capacity of 8 kW-560kW (under the 1997 Environment Protection Act). The emissions standards set for new diesel generator imports is equivalent to Bharat Stage III standards and, for in-use diesel generators, is equivalent to Bharat Stage II. The Diesel Power Generation: Inventories and Black Carbon Emissions in Kathmandu Valley, Nepal 60 emissions limits are set for four major pollutants: CO, HC, NOx, and PM. This is given in detail below:

Table 8: National Diesel Generators Emission Standards, 2012

1. Emissions Limits (g/kWh) for Imports of New Diesel Generators

Category (kW)	CO	$HC+NO_x$	PM
kW< 8	8.00	7.50	0.80
8 = kW <19	6.60	7.50	0.80
19 = kW <37	5.50	7.50	0.60
37 = kW <75	5.00	4.70	0.40
75 = kW <130	5.00	4.00	0.30
130 = kW <560	3.50	4.00	0.20

Note: This standard is equivalent to Bharat III standards.

2. Emissions Limits (g/kWh) for In-use DG Sets

Category (kW)	CO	HC	NO_x	PM
kW< 8	8.00	1.30	9.20	1.00
8 = kW <19	6.60	1.30	9.20	0.85
19 = kW <37	6.50	1.30	9.20	0.85
37 = kW <75	6.50	1.30	9.20	0.85
75 = kW <130	5.00	1.30	9.20	0.70
130 = kW <560	5.00	1.30	9.20	0.54

Note: This standard is equivalent to Bharat II standards.

a) Sampling collection point should be located at one-third of the DG set stack height.

*b) kW= Power Factor * kW*

c) Testing Methodology: Should be according to ISO 8178 or equivalent to ISO 8178 standard set by the manufacturing country.

Source: Diesel Power Generation, 2014 by The World Bank

D. Environmental Assessment Requirements

The Project is subjected to the environmental safeguard requirements of both the ADB and Government of Nepal.

i. Environmental Assessment Requirements of ADB

All projects funded by the ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects funded under ADB loan are environmentally sound, legally compliant, and safe. On the environment, the ADB Operations Manual, Bank Policy (OM Section F1/OP, 2010), underpins the SPS 2009. The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health, and Safety Guidelines.[2]

ADB's Environmental Safeguards policy principles are defined in SPS (2009), Safeguard Requirements as per ***Table 9*** given below and the IEE is intended to meet these requirements.

[2] New Version of the "World Bank Group Environmental, Health, and Safety Guidelines", April 30, 2007, Washington, USA. http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuiidelines

Table 9:SPS 2009 Safeguard Requirements

SPS 2009 - Safeguard Requirements	Remarks
Use a screening process for each proposed project, as early as possible, to determine the extent and type of environmental assessment (EA) so that the studies are undertaken commensurate with the significance of potential impacts and risks.	REA has been undertaken, indicating that the Subproject is **NOT**: (i) environmentally critical; and (ii) adjacent to or within environmentally sensitive/critical area. The extent of adverse impacts is expected to be local, site-specific, confined within main and secondary influence areas. Significant adverse impacts during construction & operation will be temporary & short-term, can be mitigated properly. Hence, IEE is sufficient.
Conduct EA to identify potential direct, indirect, cumulative, & induced impacts and risks to physical, biological, socio-economic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical, cultural resources in the context of the project's area of influence. Assess potential trans boundary global impacts, including climate change.	IEE has been undertaken to meet this requirement. (Section VI).
Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also, consider the no project alternative.	No project alternatives
Avoid, and where avoidance is not possible, minimize, mitigate, &/or offset adverse impacts and enhance positive impacts using environmental planning & management. Prepare an EMP that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.	An EMP has been prepared to address this requirement. Section IX
Carry out meaningful consultation with affected people &facilitate their informed participation. Ensure women's participation. Involve stakeholders, including affected people & concerned NGOs, early in the project preparation process & ensure that their views & concerns are made known to & understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to EA. Establish a GRM to receive & facilitate resolution of affected people's concerns & grievances on project's environmental performance.	Key informant and random interviews have been conducted. A grievance redress mechanism for the resolution of valid Project-related social and environmental issues/concerns is presented in Section VIII.
Disclose a draft EA (including the EMP) promptly, before project appraisal, in an accessible place & a form & language(s) understandable to affected people & other stakeholders. Disclose the final EA, & its updates if any, to affected people & other stakeholders.	This is the preliminary IEE based on the master plan only. Copies of both SPS-compliant IEE and GoN-approved IEE will be made available at the offices of the PMO, ICG, and WUSC for public consultation.
Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.	EMP implementation, reporting, and disclosure of monitoring reports are in this IEE.
Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically	The subproject does not encroach into areas of critical habitats. No tree will be

SPS 2009 - Safeguard Requirements	Remarks
endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.	cut. Although in due time, groundcover is expected to naturally grow over the backfilled affected area, EMP recommends seeding of the re-surfaced area to accelerated re-growth.
Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health, and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	This requirement is marginally applicable to the Subproject regarding waste generation. The Subproject will not involve hazardous materials subject to international bans or phase-outs.
Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.	EMP provides measures to mitigate health and safety hazards during construction and operation.
Conserve physical, cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during the environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.	The Subproject will not affect any physical, cultural resource. The EMP recommends the measure/s mitigate the adverse impact on PCRs in the case of the chance find.

Source: ADB, SPS, 2009

ii. Environmental Impact Assessment Requirements of Nepal

The Environmental Protection Rules (EPR, 1997) defines the process that should be followed for the preparation, review, and approval of environmental assessment reports. The process applicable to the project is summarized in ***Table 10***. The key environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are included in ***Annex B***.

Table 10: The GoN IEE Report Preparation, Review, Approval, and Implementation Process

Steps in the Process	Remarks
Proponent refers to EPR Schedules 1 & 2 for the required environmental assessment (IEE or EIA) to carry out.	Subproject requires an IEE.
If a proposed project requires an IEE, Proponent prepares an IEE schedule of work/ToR using the format prescribed in Schedule 3 of the EPR and submit this to the CSA for approval.	ToR has not been prepared. This IEE is based on master plan only.
Proponent carries out IEE according to the approved work schedule/ToR and prepares an IEE Report following the format prescribed in EPR Schedule 5 and incorporating stakeholders' feedback applying the consultation procedure specified in the EPR.	The Subproject carried out the IEE and prepared the IEE Report accordingly.
Proponent submits 15 copies of the IEE Report along with the project proposal and recommendation of the concerned town or town to the CSA.	The subproject will submit documents accordingly for review and approval.
CSA conducts review and grants approval of IEE Report.	Subproject's IEE Report will be taken approval from the concerned ministry
If the review reveals project implementation to have no substantial adverse impact on the environment, CSA grants approval within 21 days of receipt of the report.	
If the review reveals the necessity to carry out an EIA, Proponent conducts an EIA following the prescribed EIA process.	
Proponent implements approved IEE Report and any terms and conditions given the approval.	Subproject has not started implementation.
CSA monitors and evaluates the impact of project implementation. When necessary, issue directives to the Proponent to institute environmental protection measures.	Subproject has not started implementation.
MoPE conducts the environmental audit after two years of project commissioning/operation.	Subproject has not started implementation.

Source: EPR, 1997 with Latest Amendments 2017

III. ANALYSIS OF ALTERNATIVES

A. With- and Without-Subproject Alternatives

Analysis of the alternatives of the proposed project is another important process of IEE study that will help to assess the feasibility of the project in regard to technical, environmental & social aspects. Primarily, this involves two alternatives that includes "Without Project" or "Do-nothing" Alternative and "With Project" Alternative.

iii. Without-project' or 'do-nothing' alternative

"Without Project" or "Do-nothing" Alternative conducted study on the existing water supply system to analyze the existing condition of the project town in the absence of the proposed project.

The study shows that the residents of the project area are consuming water from stream and kuwa where the tapped aquifer is easily susceptible to pollution and contamination. There is no treatment plant in existing systems. The water is directly distributed in the town through small service reservoirs. Though there are not any evidence of impacts of untreated water on the lives of local people at present situation, there is possibility of incidence of water-borne diseases in the future due to continous consumption of unsafe and untreated water. This will result in the health hazards in the project area that will in turn expose the surroundings to environmental problems.

There are various but small existing water supply systems. The existing water supply systems within the project area is intermittent and is not able to meet the increasing demands of the increasing population of the project area. Insufficient water supply will compel them to control the use of water for various purposes even for sanitation practices. Lack of water in the sanitation practices like flushing of water after use of latrine, bathing, washing clothes etc. will demote the domestic hygiene of the project area. This may pose outbreak of diseases like Typhoid, Cholera, Dysentry etc. This may in turn result in various environmental problems.

'Without Subproject' or 'Do-Nothing' alternative will toughen the chance of the occurrence of the abovementioned threats to the environment of the project area. Without subproject, people of the project area will continue to consume the partially treated or untreated water from the existing water supply system. This may increase the risk of bacterial infection resulting health issues that will obviously have impact on public health, animal health and the health of the ecosystems. Similarly, 'Do-Nothing' alternative will constrain the locals to be content with the intermittent water supply service.

This would further impede (i) further social and economic development of the municipality, (ii) fundamental right related to health as guaranteed in Constitution of Nepal (Article 35) that says that "Every citizen shall have the right of access to clean drinking water and sanitation", (iii) Goal of National Urban Water Supply & Sanitation Sector Policy,2009 (Final Draft) to ensure the socio-economic development, improved health status and quality of life of urban populations, including the poor and marginalised, through the provision of sustainable water supply and sanitation services and protection of the environment and (iv) Nepal's delivery of its commitment to SDG 6th to increase the proportion of the population with sustainable access to safe drinking water and basic sanitation.

Beside this, 'Do-Nothing' alternative has one positive aspect as it may prevent the service area of the project town from the susceptibility towards the anticipated environmental impacts of this proposed project. However, for this only positive aspect, it will be irrational to ignore the hardship that locals of this project town are facing for safe,reliable and potable water. Hence, 'Do-Nothing' alternative will not be better option to be followed in order to get rid of the anticipated environmental impacts as these environmental impacts can either be avoided or minimized by suitable mitigation measures.

iv. With Project alternative

With Project Alternative was also analyzed by envisaging the likely benefits of the proposed project. The analysis shows that the proposed sub project will be the best alternative to overcome the aforementioned threats that is likely to occur in the absence of this subproject. With the Subproject 29,603 populations (2018) will be benefitted from adeqaute, safe, reliable and potable water supply & sanitation service. In overall, the 'with subproject alternative' will bring about the improved public health and living environment that will contribute to improved quality of life in the project municipality.

Hence, the 'with project' alternative will contribute to the realization of the Updated 15-Yr Development Plan for Small Towns Water Supply & Sanitation Sector, compliance with the fundamental right related to health as guaranteed in Constitution of Nepal (Article 35), fulfillment of Goal of National Urban Water Supply & Sanitation Sector Policy,2009 (Final Draft) and the delivery of Nepal's commitment to SDG 6.

Along with this, the limitation of "Without Project" Alternatives continuous water supply system, treatment system and susceptibility to water borne diseases leads to opt for "With Project" Alternative. The proposed sub project will be the best alternative to overcome the aforementioned threats that is likely to occur in the absence of this

subproject.This "With Project" Alternative also involves analysis of alternatives to assess the most cost-effective, reliable and efficient system that can serve the design population. The alternatives regarding "With Project" Alternative is described in detail in the following section.

B. Alternatives Relative to Planning and Design

As per Feasibility Study Report by PPTA team, the system design for the town has been done under two scenarios. The optimization of a proposed water supply system can be done regarding system layout, alternative technology, alternative materials and alternative source. In case of Panchkhal WSSP, the development of system alternatives has been done using alternate system layouts keeping other parameters constant.

i. Alternative Sources

There are no other alternative sources available in the nearby vicinity to meet the overall demand for this project. Both options has proposed Sunkoshi River as the proposed source. There is no other reliable source nearby service area except Sunkoshi water source.

ii. Alternative Design

The environmental issues can be a deciding factor to choose the best alternative design among the list of alternatives. The design of both proposed alternatives is environmentally sound. In both alternatives, the structures from WTP to the distribution network remain the same. The distribution network will be same for both options. The main difference between the proposed alternatives is the design of transmission pipe line. Both alternatives are briefly discussed below:

a) Alternative I: Use of Required Flow from Sunkoshi River by Pumping with Double Pipes and Supply Water to Distribution System by Eleven RVTs

The system will be pumping system. First of all, water will be pumped from sumpwell (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head 210m to 220m at each stage to reach water at the treatment plant at an elevation 1337.50m.

After water reaching at Bhairab Mandir WTP/ ridge, a few quantity of water will be pumped towards Palanchowk Bhagwati RVT. Another major pipe line goes to the nine reservoirs by gravity system. Similarly, the thrid pipeline will pump water to Backwash RVT that has been proposed to backwash the proposed filter. This backwash RVT will also act as distributor that will supply water to RVT 11 at Kharelthok by gravity.

The team visited all locations and collected basic information of intake, WTP and reservoir locations and service area. The team has informed WUSC to take the ownership of land for the construction of structures, intake. Also informed to the WUSC to register the source as per government rules and regulations.

Hence, the total estimated transmission pipe line length ie sump well to WTP/ Bhairab Mandir is 9135.00 m. Two parallel pipes are used in main transmission.

b) Alternative II: Use of Required Flow from Sunkoshi River by Pumping with Single Pipes and Supply Water to Distribution System by Ten RVTs

The option I and option II are almost same but the main transmission for this alternative has only one pipe. This may be risky for the proposed water supply system. However, the option has been made for the study. The total estimated transmission pipe line length ie sump well to WTP/Bhairab Mandir is 6,784.00m.

iii. Selected Alternative Scheme

Environmentally, they are not much different and both of the alternatives have no such environmental issues too. Socially, both alternatives are on equal footing.

The financial indicator also indicates that the affordability percentage of the source in both alternatives I and II is almost same. The affordability is in between 3%-5% in alternatives I and II. Financially, alternative II is slightly more economical than alternative I. The increase in project cost in alternative I is due to design of two parallel pipes along the transmission main. These pipes are used in pumping stages and is the lifeline of the project which is essential for such type of project to minimize water interruption. If alternative II is selected for the proposed project, financially it may sound feasible but, technically the system may get failed as there is high possibility of interruption ot the water supply service under the condition of pipe damage in the future if any. Hence, alternative I is recommended for further study though the cost is slightly higher than alternative II.

This indicates that the Alternative II is unfeasible option for the project town as per technical assessment. Hence, Alternative I has been selected as the best feasible alternative as this alternative is technically, environmentally and financially feasible.

IV. DESCRIPTION OF THE PROJECT

A. Proposed Service Area

Discussion was held with WUSC for the delineation of service area of the proposed project. Regarding this, the initial discussion was carried out with users committee on various dates. As per WUSC, the following areas of Panchkhal municipality have been selected for the proposed project. The names of the major settlements of the service area of the project town are as follows:

Ward no 2: Tinkune, Bagaladihi, Dwaredihi, Majhdihi, Takedihi, Ratopahiro

Ward no 3: Lamidihi, Jantadihi, Kaplidihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok

Ward no 4: Zero Kilo, Lamidanda, Pachkhal, Purano Bazar,Tamaghat

Ward no 6: Dulalthok, Bakhreldihi, Tinpiple Bazar, Ekatabasti, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi

Ward no 7: Sigrampati, Shikharpur, Jorpiple

Ward no 8: Khattar, Padalla, Simradi,Kharani(Madi Gau)

Ward no9: Bhimsenthan,Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun

Ward no 10: Nayagaun, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar

Ward no 11: Luitelgaun, Devbhumi, Ojhatar,Karketar, Kharelthok, Jaretar,Bakultar, Ranipani, Serabesi

Ward no 12: Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote, Tinghare, Nagbeli, Aapghari

The proposed service area of the proposed project is depicted in the figure given below:

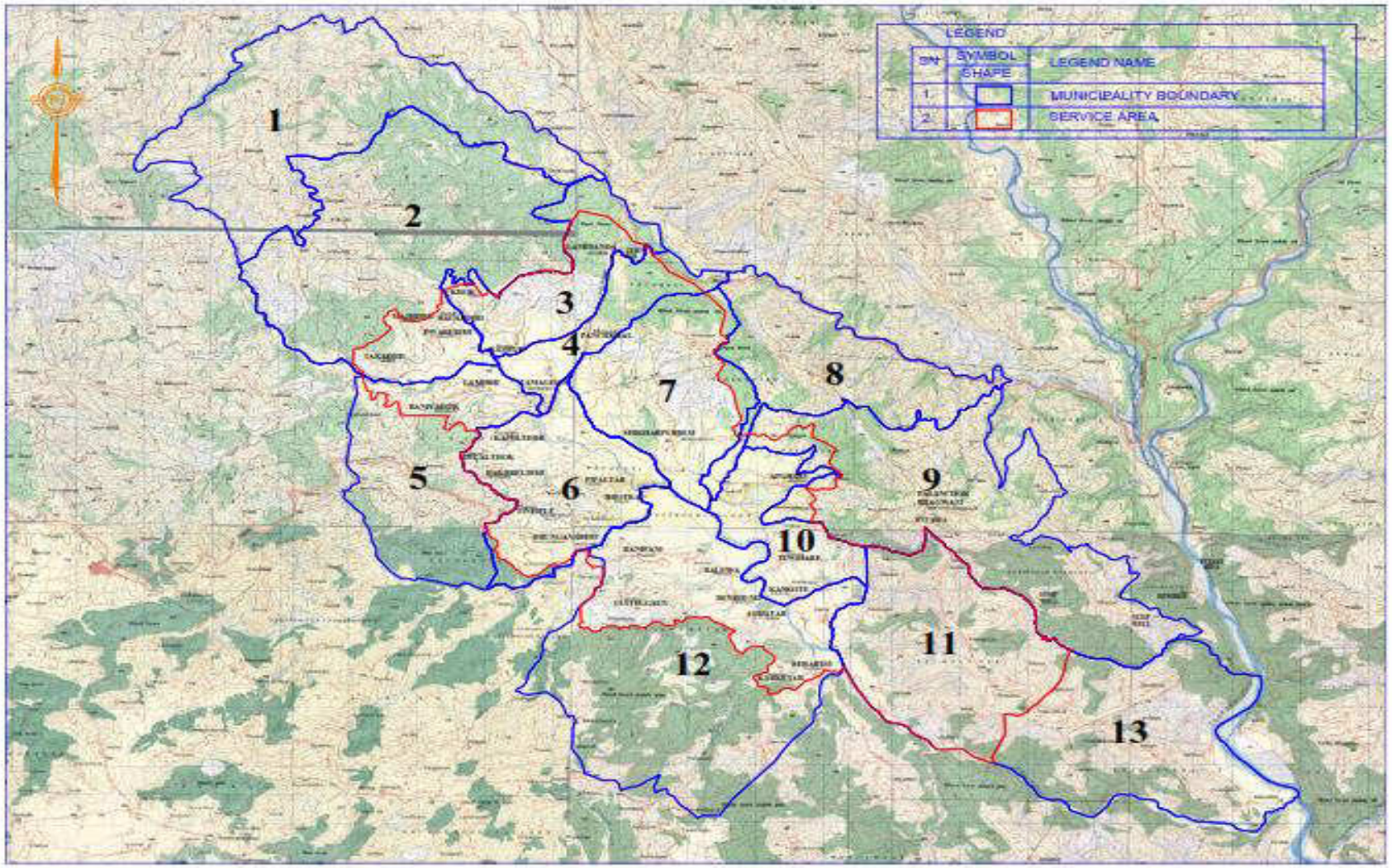

Figure 2: Proposed Service Area

B. Project Components

i. Water Supply Components

The proposed sub-project is completely a new system. It comprises of both pumping system and gravity system. Firstly, water will be pumped from the proposed sump well at the proposed river bank to the proposed water treatment plant site with five stage pumping. After this, some quantity of water will be pumped towards Palanchowk Bhagawati RVT. The remaining water from WTP site will be supplied to other ten reservoirs through gravity system.

The required flow for the proposed water will be drawn from the seepage of Sunkoshi River by pumping with double pipes and will be supplied to the distribution system by the proposed eleven RVTs.

The following sections describe the proposed sub project components.

a) Source/Intakes

Regarding the water sources, the team had discussed with the WUSC members, local bodies, concerned beneficiaries and key personnel of the project area. As per the information given by the community people during mass meeting ans as per our field study, there is only one reliable source available in the area that is not other than Sunkoshi River. The existing source will be used as it is but they are not considered for the new system. Sunkoshi river surface water source is used in the new system. They are demanding to use Sunkoshi river surface water source rather then using small stream water source available in the vicinity of the service area. The yields of these sources are much more than required, so population of the project area become benefited to use water for longer time.

The source Sunkoshi river has plenty of water. The seepage water of the river will be tapped through the construction of Infiltration Gallery. The proposed intake/sump well site is located at the right bank of Sunkoshi river at Bimiredobhan, which is about 2.5 km downstream of Dolalghat Bazaar (i.e. 2 km downstream of the confluence of Sunkoshi and Indrawati).

The exact location of sump well and collectors will be finalized during implementation after test drilling at site. If the soil starta at the proposed site has layer of rock, the location will be shifted or altered nearby proposed location. Based on the drilling, the collector and sump well site will be finalized with minor modification in design, if necessary. There are two sump wells designed in the system. Each sump well will have

two collector wells. The collector well as well as sump well will collect water at the sump well and the water will be pumped.The perforated pipes are designed to flow the water from the filter media to collectors and sump well. The retaining wall at the hill side and river side have been designed to protect the structures. The river side RCC retaining wall will be constructed to prevent the flood ino the intake site. It is envisaged that each sump well will collect water more than 42 lps. Accordingly, the perforated pipes are arranged considering the possibility of clogging of perforation in pipes.

The system will be pumping system. First of all, water will be pumped from sumpwell (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head about 210m to 220m at each stage to reach the water at treatment plant at an elevation 1,337.50m. The water treatment plant is located at about 250m downstream of Bhimsenthan Mandir beside existing NEA transformer. After treatment, the clear water will be stored at 400cum ground storage reservoir. Small individual pumps are used to pump the required quantity of water towards Palanchowk Bhagwati RVT-10 and filter backwash RVT-12. Another major pipe line goes to the nine reservoirs by gravity system. Filter backwash reservoir will supply water to Kharelthok RVT-11 and back wash of filter by gravity.

The perforated lateral pipes are connected at collector and sump well and extended to wards the river. Each collector will have 7 m long 20 numbers and sump will have 16 numbers pipe of perforated top half dia. of 140mm dia PE100-PN10 pipe. The perforation 7mm has been provided 25% opening on top half dia of pipe sloping 1% towards collector/ sump well.The pipes covered with layers of filter material.

Likewise, arrangement has been made to supply water directly from Sunkoshi river to the collector/ sumpwell, if infiltered water into sumpwell will not meet the required demand. Also two sump well are connected each other to allow the water from each other.

Water pumping required from each sump well is 42 lps. Each sump well shall have two pumps and both will be operated at a time. Each pump will be operated 20hours in a day during design year.

River seepage water infiltrate from gravel/ filter media is collected in collector/ directly into sump well. The water may bring small silt particle. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the

collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement are made.

The proposed water source is deemed to be technically viable regarding the stability, source discharge, less transmission main etc. However, test drilling shall be carried out during implementation to fix the exact location of collectors and sumpwells.

b) Electrical System

The proposed project has pumping station at each stage to reach water at WTP site. The overhead electrical transmission line will run along the pipe line route to supply power to each stage to run the pump. All the pumps at sump well, stage 2, stage 3 and stage 4 will be operated at a time to supply water at WTP/ storage reservoir. These pump stations are connected in series cascade mode. If one of the pumps fails to run due to any technical fault, the remaining pumps can deliver water from sump well to WTP/ storage reservoir. Hence, as per design of the electrical system, there is provision to shut only one pump in a control system if any of the pumps fails to run. Similarly, among the two pumps at WTP site and at backwash RVT, only one will be operated at a time.The capacity and number of pumps at various stages are given in ***Table 11***.

Table 11: Capacity and Number of Pump

Location	*Number and capacity of pump*	*Remarks*
Stage-1 Sump well	4 nos × 85 HP	All pumps run at a time
Stage-2	4 nos × 85 HP	All pumps run at a time
Stage-3	4 nos × 85 HP	All pumps run at a time
Stage -4	4 nos × 85 HP	All pumps run at a time
WTP/RVT Site for RVT-10	2 nos × 20 HP	Only one pump runs at a time
WTP/RVT Site for Backwash RVT	2 nos × 5 HP	Only one pump runs at a time

Source: DEDR,2019

There will also be the arrangement of Spare Pumps for Stage 1 to 4 at designated storage area for replacement such that if any pump does not function properly, it can be replaced immediately. The capacity of pump at each pipe will be divided by two to obtain small size of pump at each option; this will be easy for the future operation & maintenance and to obtain spare parts.

One transformer with 2 -diesel generator back-up will be arranged at each pumping stage to supply the power for the pumps at four major stages. Likewise, for minor stage (5th stage i.e. WTP/ storage RVT), one small transformer and generator has been designed. The transformer and diesel generator is designed as given in ***Table 12***:

Table 12: Transformer and Diesel Generator

Description/ Pumping Stage	Pumping Stage 1			Pumping Stage 2			Pumping Stage 3			Pumping Stage 4			Pumping Stage 5		
Pump	HP			HP			HP			HP			HP		
Pump 1	85	63.75	KW	85	63.75	KW	85	63.75	KW	85	63.75	KW	20	15	KW
Pump 2	85	63.75	KW	85	63.75	KW	85	63.75	KW	85	63.75	KW	5	3.75	KW
Pump 3	85	63.75	KW	85	63.75	KW	85	63.75	KW	85	63.75	KW			
Pump 4	85	63.75	KW	85	63.75	KW	85	63.75	KW	85	63.75	KW			
Other load		3	KW		3	KW		3	KW		3	KW		7	KW
Total load		**258**			**258**			**258**			**258**			**25.75**	
Safety factor		1.25			1.25			1.25			1.25			1.25	
Net total load		**322.5**			**322.5**			**322.5**			**322.5**			**32.19**	
Transformer size		403.13	KVA		403.13	KVA		403.13	KVA		403.13	KVA		40.23	KVA
All pump operate at a time															
Adopt : Transformer Capacity		**500**	**KVA**		**500**	**KVA**		**500**	**KVA**		**500**	**KVA**		**50**	**KVA**
Generator size		503.91			503.91			503.91			503.91			50.29	
Reqd: Generator size (total)		600	KVA		600	KVA		600	KVA		600	KVA		50	KVA
Adopt:Generator -2nos of each to meet 50% demand		**160**	**KVA**		**160**	**KVA**		**160**	**KVA**		**160**	**KVA**		**50**	**KVA**

Source: DEDR, 2019

Distribution System: The power cables from control panels to each load are calculated to satisfy the following criterions:

- Current carrying capacity of the cable is enough to carry the full load current continuously.
- Maximum voltage drop in the cable is less than 2% of the system voltage.
- The control panels at pump house are provided with the Star-Delta starter to reduce the high starting current drawn by the pump-motors.
- It is envisaged that the pump will be operated 97.5% and generator will be operate 2.5% in total operation hour.

c) Interruption Chamber/ Break Pressure Tank

This tank has been proposed at the location where the pressure at the pipe is more than the rated pressure. The proposed Break Pressure Tanks (BPTs) will be constructed at six locations that includes a) 50m^3 capacity along Branch Transmission Line, b) 10m^3 capacity along RVT-10 distribution system for Chisapani, c) 10m^3 capacity along RVT-10 distribution system for Gairigaun, d) 10m^3 capacity for RVT-9 distribution system, e) 2 nos -10m^3 capacity for Kharelthok distribution system. Introducing the IC/BPT, the pressure will become zero at its outlet and pressure in the downstream pipe is designed based on the pressure of IC/BPT. Here, RVT-9 will supply water for distribution system and serve the purpose of IC for branch transmission system.

d) Transmission Main & Pumping

Transmission mains refer to the pipe line running from intake to reservoir which comprises of two parts i.e. Main Transmission (Sump Well to WTP at the ridge of Bhairab Mandir) & Branch Transmission (WTP to various reservoirs). The transmission

line passes via road, barren land and public land. The main transmission main comprises three mains that includes a) Mains that goes to branch transmission by gravity; b) Mains that goes to Palanchowk Bhagwati by pumping and c) Mains that goes to Bhimsentahn WTP backwash RVT by pumping.

The total pipe length of the main transmission from the proposed Sunkoshi river intake/ Sump well to the proposed treatment plant site/storage reservoir is about 9,135.00m including 5% more than the actual one, which comprises of DI pipe with Flanged End of diameter 200mm. Submersible pumps of total 4 nos.-85HP (at each stage 1, 2, 3 and 4) capacity are installed in two sumpwells/ intakes to various stages and these pumps will pump water upto the water treatment plant at 5th stage site at the downstream of Bhimsenthan beside NEA transformer. There is also provision of two parallel pipes for water lifting purpose along the transmission mains to avoid the interruption of water supply service if one pipe need repair.

Each pump will pump 21.0 lps water to WTP. In total, one pipe will carry 42.0 lps water by pumping. Two pipes will withdraw 84lps water to WTP. The pump capacity is determined accordingly. But, based on the pump catalogue, each pump will pump 22.21 lps and 4 pumps will pump 88.84 lps, which is more than required. After treatment, 5.71 lps water will be pumped to Palanchowk Bhagwati (RVT-10), 4.98 lps will be pumped to Filter Backwash RVT-12 and the remaining 73.31 lps water will be supplied to other proposed nine service reservoirs RVT-1 to RVT-9 by gravity. The Filter Backwash RVT 12 will supply 1.75 lps water to Kharelthok (RVT-11). The remaining 3.23 lps water will be used for the filter backwash purpose. There is also provision of disinfection before the storage of water within the ground storage reservoir at WTP site.

The total branch transmission length i.e. from WTP/storage reservoir to 11 RVTs is 37,237.00 m including 10% more than the actual one having pipe size PE pipe (63-110) mm dia. and 5% more than the actual having pipe size DI 100mm to 250mm dia are used. No house connection will be permitted from branch transmission before reaching water to RVTs except RVT-11. Branch transmission for RVT -11 comes from filter backwash RVT. Due to topography, some houses will get water from the branch transmission main before water reaches to RVT-11. Four types of pipes will be used in this branch transmission main system that includes PE-100 PN 6 of diameter 110 mm, PE-100 PN 10 of diameter 63 mm, DI pipe with Socket End of diameter (100-250)mm and DI pipe with Flanged End of diameter (100 to 250) mm.

e) Thrust Blocks, Saddle Blocks and Thrust Beam

Thrust blocks have been proposed for DI pipes (transmission and distribution mains for both alternatives) from being moved by forces exerted within the pipes arising from the internal pressure of the pipeline or the flow of water hitting bends, tapers and closed or partially closed valves. Typical thrust blocks have been designed for a pressure of 24 kg/sq cm for both transmission lines and distribution line.

Similarly, theres is also provision of Thrust Beam & Saddle Blocks for DI pipes that will be laid up in sloppy areas and un-buried portions. All saddle blocks are proposed to be anchored with concrete at the center of each pipe to prevent movement. Provision of RCC support for the stretches of buried & un-buried DI pipe line has also been made to prevent pipe movement which are laid-up in sloppy area.

f) Water Treatment Plant and Chlorination

Based upon the water quality, secondary data available, discussion with community in the surrounding of the service area, the following treatment plant has been proposed for the seepage/ infiltered water pimped from the proposed Sunkoshi river water source.

The water quality of the streams/ river varies from time to time at every rain and carries suspended solid, other organic and inorganic impurities. However, it is envisaged that the seepage water will have better quality that the surface water. First level filtration will be carried out at sump well site while preparing the infiltration gallery surrounding the collector and sumpwell. River seepage water infiltrated from the gravel/ filter media is collected in collector and directly into sump well. The water may bring small silt particles. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement has been made. If the quantity of water collected at the sump well is not enough, direct water feed from the river is also provisioned.

After pumping, the rapid mixing chamber (coagulation) followed by floculator followed by sedimentation followed by rapid sand filter followed by desinfection are designed in sequence. After the treatment the water will be stored into storage reservoir.

Small rapid flash mixture one unit of size 2.0m x 2.0m x 2.0m, baffle wall flocculator 5 units of each 7.50 x2.50m x 1.20m; sedimentation tank 4 units 19.50m x 6.50m x 3.00m, rapid sand filter 2 units of each 8.25m x 6.25m x 3.5m and disinfection are designed. Accordingly, the inlet outlet arrangement of each filter units together with necessary valve arrangements are provided in the detailed drawings. The bypass

arrangement from each filter inlet/ outlet are also provisioned for the repair and maintenance of the structures or the quality of water available from the infiltration would be good enough for some period during seasonal variation and may not need all filter to operate. Also, the backwash arrangement of rapid filter has been arranged. A backwash reservoir (RVT-12) is provisioned and will supply water to Kharelthok RVT-11 by gravity and supply water to backwash the filter. Only one filter will be backwashed at at time at every 20-24 hours interval for 15 minutes by water. About 129.2 lps water will be used to backwash the filter with pressure head 10-12m. About 4% water is provisioned for filter backwash. Accordingly, the filterback wash reservoir is designed. In addition, air compressor has been kept provisionally to back wash the filter, this will be finalised during implementation. However, pipe and fittings arrangement have been made.

An emergency feeder line consisting of a solution tank connected with feeding tank having a constant level is proposed for the chlorination. FRP pump is used for this purpose. Bleaching powder 6.62kg / day and 9.65 kg / day require during base year and design year respectively. After disinfection some part of the lime will be settled at the bottom of the ground reservoir as residue. This residue shall be removed through washout. The washout pipe will be connected with the drain.

g) Sump Reservoir/Service Reservoir

The distribution system has been designed by using multi-reservoir concept due to topography of the town which was also adopted in the existing system at various elevations. The total storage requirement for the system at the end of the design period shall be about 2,300m^3. This capacity will be divided into various reservoirs that will be constructed at various locations. There is provision of sump RVT of 150m^3 capacity, each at pumping Stage 2, 3 & 4 and 1no of 400 cum capacity at WTP site. These reservoirs act as storage reservoirs. Similarly, there is also provision of backwash RVT of 150m^3 capacity that will also distribute water to Kharelthok RVT by gravity.

There is also provision of eleven service reservoirs that include 6 no RVTs of 150 m^3 capacity at six locations (RVT 1-U/S Municipality, RVT 2-Anekot, RVT 3-Sashastra RVT, RVT 4-Bakhrel Dihi RVT, RVT 7-Jaretar and RVT 8-Shikharpur RVT), 3 nos RVT of 100 m^3 capacity at three locations (RVT 5-Radha Krishna School, RVT 6-Nayagaun RVT and RVT 10-Palanchowk RVT) and 2 nos. of 50m^3 capacity at RVT-9(9N29) & RVT11-Kharelthok. The storage at each pumping stage is provided for only 0.5hr and ground storage at WTP site is provided for 1.25hr. All reservoirs will supply water in independent/ separate sub-service area.

h) Distribution Main and District Metering Area

The distribution system comprises a pipe network, which is designed in loop network system. The entire new distribution system has been designed by using GI, DI and PE-100 pipe. The PE-100 pipes of a) PN 6-(50mm to 250mm) dia.; b) PN 10-(50mm to 250mm) dia and c) PN 16-(50mm to 225mm) dia. have been used in the design Similarly, DI pipes with scoket end of diameter 150mm & 200 mm have been used in the design. GI pipe of 40mm to100mm dia. are also used in the design. The minimum pipe size for the distribution mains used in the design is PE100- 50mm, which governs the velocity. PE100 pipe above 4 kg/cm² pressure are proposed in the distribution network design as per technical requirement. PE100-PN6 pipe of 50mm and 63mm pipes are not used in the design due to technical difficulties to join the pipe with electrofusion technology. All PE pipes will be joint using electro fusion technology. The washout and air valve have been arranged in the distribution system in control valve/ pipe valve chamber, where possible. In some nodes, the residual head is considered high to maintain the residual head in the downstream node.

The flow in each line has been calculated based on the socioeconomic survey data and possibility of rapid increment of settlement in the near future. The Pipe Valve Box/ Valve Chamber have been proposed at suitable junctions to regulate the design flow in each pipe line and to stop the flow in the particular area without affecting the other area during repair & maintenance. All the distribution lines pass along the road network and public land. The distribution lines have been proposed on both sides in core bazaar area while, single pipeline has been designed in other remaining areas. Due to undulations/ irregular topography, two pipes are designed along one road among which one pipe will supply water at the highest level without distributing water to the households and the other pipe will distribute water to the households upto bottom.

The pipeline is designed by adding 10% extra length of actual one. The estimated distribution pipe is taken as 10% more than the actual one for PE pipe up to 90mm dia. and 5% more than the actual one for remaining all pipes is 189,309.00m. The design of this distribution system is based on the concept of District Metering Area (DMA). Each DMA will have bulk meter to determine the flow into respective service area. Each service reservoir is treated as one DMA. Hence, there are 11 DMAs within the proposed service area to supply water from each service reservoir. RVT location/ DMA boundary is fixed depending upon the elevation difference, location and easy for operation and maintenance. It is presented in ***Figure 3*** given below:

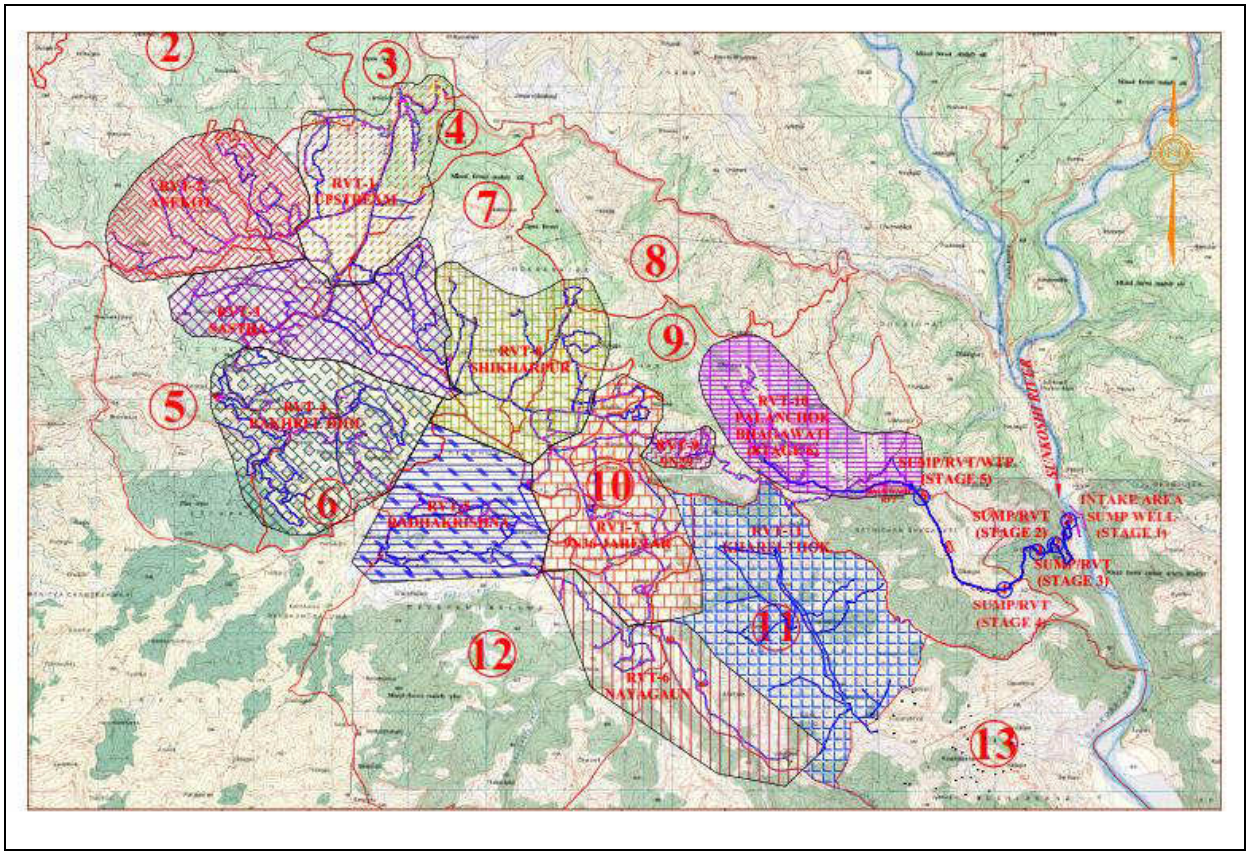

Figure 3: District Metered Area (DMA) of the Proposed System

i) Household Connections

The household shall connect the tap to their household by directly from main distribution pipe. The average 15m length of 20mm dia. of PE 100-PN16 pipe with compression joint, joined with GI fittings and valves up to meter for each HH connection. There will be 5,998 taps in the system during base year. The meter shall be kept near and adjoining the compound of the houses. After meter, each HH should extend the pipe themselves as they desire. The necessary fittings have been designed. Electro fusion saddle has been proposed to join the HH connection at main pipe to connect ferrule in the saddle. Likewise, GI and DI saddle clamp are proposed to join the HH connection at main pipe to connect the ferrule for GI or DI pipes.

Two types of tap stands have been designed for the project. At the end of the design period, it is anticipated that about 76.50% of the total household shall have fully plumbed, 23.50% of the total household shall be served through yard connection. The poor house connect tap at free of cost through OBA. There will be total 7,094 fully plumbed and 2,179 yard taps will be connected during design year. In total, there will be 9,312 connection including institutional 39 connections during design year.

j) Appurtenances

- **Bulk Water Meter:** The bulk water meter is designed at various locations in the distribution system to ascertain the leakage in the distribution system. The main bulk meter is kept at the outlet of service reservoir. Each reservoir is served as DMA. Each bulk meter will provide the quantity of water supplied in the particular area and leakage in that area can be determined calculating the sum of HH water consumption. Accordingly, the repair and maintenance works can be carried out, if the leakages more than the permissible range.

- **Types of Connections:** Consumers have been classified in three categories depending on their income level. The consumers having high level of income requiring more consumption of water are placed in fully plumbed category, consumers having medium income and medium consumption level and consumers of low income group and who can't afford tariff of fully plumb connections and use less water through tap connection at their household will be benefitted through yard connection. The social survey has been carried out. The poor household will get tap free of cost with OBA programs. However, WUSC has to reconfirm the poor household during implementation of the scheme.

  The cost estimate of the taps for all household and institution has been included in project cost estimate. During execution of the project, the poor household shall connect tap from OBA facilities with recommend of WUSC.

- **Wash out Valve:** Washout valves have been provided at depressions points in the pipeline, where necessary. The purpose of the valve is to clean the debris collected in the pipeline. Sometimes, the valve can also be used for the maintenance of the pipe line without closing the whole distribution system.

- **Air Valve:** The air valves are provided in transmission and branch transmission main. The air valves have been designed to release the air accumulated in the pipes. The water flowing through pipes always contain some air. This air tries to accumulate at the highest points and may interfere in the flow by narrowing pipe opening area. Air relief valve is provided in the distribution pipe near the overhead reservoir to provide the exit for such accumulated air. Also, the automatic air release valve is provided in distribution system at several locations.

- **Check Valve:** This type of valve normally allows water to flow through it in only one direction. This valve is a two port valve which has two openings in the body;

one for water to enter and other to leave. This valve is mainly for a specified cracking pressure which is the minimum differential upstream pressure between inlet and outlet at which the valve will operate. This type of valve has been proposed at each pumping stage.

- **Control Valve:** The purpose of the control valve is to regulate the required flow in each distribution main from the junction/ node. Sometimes, it can be used for the maintenance of distribution system in particular area without closing whole distribution system. A control valve is provided in the system where there are more than two branches from one junction or where it is necessary. Control valves have been designed in suitable distribution junctions having more than two mains and in required places to regulate the design flow in the main. The design flow in each pipe line is based on design population, non-domestic demand and system wastage and leakage. The future demand in the main may fluctuate and the control valve/ regulating valve shall be useful to deliver the required flow in pipe line.

- **Pressure Relief Valve:** The pressure relief valve is a safety valve that keeps the pressure within safety limits to prevent equipment failure, mishaps or other undesirable outcomes. Pressure relief valves will be designed with controls to increase or decrease the level of pressure in a pressure vessel. This type of valve will be installed at each pumping stage.

- **SCADA Valve:** This type of valve is operated by SCADA (Supervisory Control and Data Acquisition) system. This SCADA system is a control system that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management, but uses other peripheral devices such as Programmable Logic Controller (PLC) and Discrete PID controllers to interface with the process planr or machinery.

  A collection of equipment that will provide an operator at remote location with enough information to determine the status of a particular piece of a equipment or entire substation and cause actions to take place regarding the equipment or network.

  Supervisory Control and Data Acquisition (SCADA) achieves this requirement collecting reliable field data through remote terminal units (RTUs), Intelligent Electric Devices (IEDs) and presenting them to user requirement. The user

interface or the man machine interface (MMI) provides various options of data presentation according to specific application and user needs. There are many parts of a working SCADA system. A SCADA system usually includes signal hardware (input and output), controllers, networks, user interface (HMI), communications equipment and software. All together, the term SCADA refers to the entire central system. The central system usually monitors data from various sensors that are either in close proximity or on-site.

Basic SCADA is proposed/ designed for Panchkhal town. The outlet management system (OMS) from each pumping stage outlet and reservoirs outlets, Reservoir management system (RMS) at each inlet of reservoirs. These are not provided in pumping stage reservoirs inlets. The automation to link all the components through SCADA (Hydraulically Supervised Control and Data Acquisition) and all the mentioned components which shall be capable to enable to control and monitor the parameters from hSCADA room/ master control center for submersible pumps of all for main and one small stages, Water level sensors for all RVTs are provided. Likewise, water supply system operation and maintenance, one year operation and maintenance for SCADA is also provisioned.

The proposed system shall work under Wi-Fi coverage area, on the GPRS network or on a given radio frequency. The radio frequency is a free of cost communication media, but the limitations it has are, eye visibility of two connecting devices and the distance between them. Similarly, it would be difficult to reach all equipment within Wi-Fi coverage also. The other way out is the GPRS which shall work with the 3G and above cell phone network area. The services of the network providers having a full network in the given area can be used

- **Fire Hydrants:** Fire hydrants will be provided at major road junctions. These fire hydrants shall also be used for flushing of the system as required. Fire hydrants, namely, stand post type, conforming to IS908 is recommended.

k) Valve Chambers

Two type of Chambers have been proposed in the project to control or regulate the flow of the proposed water supply system. The chambers constructed by brick masonry have been provided in non-vehicular areas and rural area. In other vehicular carriageway and city area, chambers constructed with RCC has been provided.

The chambers shall serve as housing, protection and convenient access to these pipe appurtenances. Inside the concrete chambers, necessary supports shall be provided for pipes and valves at appropriate locations. Access to the valve chamber will be given via lockable cast iron covers with frames. Manhole covers of the heavy-duty type have been recommended in RCC chambers. Covers for manholes in paths may be proposed of medium duty type.

In total, there are 179 nos. pipe valve boxes and 36 washout/ air release/ control valve chambers designed in the distribution system.

l) Generator House

A Generator house will be constructed at each pumping stage and WTP site. The Generator will supply power mainly for pumps installed at various stages of pumps, when there is no regular power from NEA. The generator of capacities will be of 2 nos. of each 160 kVA at each stage 1, 2, 3 and 4 and 50 kVA at WTP site for stage 5. Only two pumps among four will run at a time at stage 1, 2, 3 and 4 and one pump for filter backwash RVT-12, one pump for RVT-10 will run at a time for stage 5 (WTP) site. Two generators at stage each will pump 50% of the demand. If one generator gets out of order, only one generator will be operated and supply 25% of water.

m) Laboratory Building cum WUSC Office Building, Guard House and Dosing House

A two storeyed laboratory building cum WUSC office building has been designed and this has been proposed to be conctructed in Panchkhal Bazaar. WUSC will provide the land for the construction of office The preliminary water quality test kits are arranged for regular water quality monitoring.

There is provision of Small Guard House (G1) at each pumping stage (Stage 1 to 4), at Backwash RVT and at 11 service reservoir locations. Hence, in total, 16 small guard houses have been proposed. Similarly, one Medium Guard House (G2) have also been proposed at WTP site.

n) Boundary Wall & Retaining Wall

The retaining wall has been proposed at sumpwell site, stage 2,3,4 and WTP site and each reservoir site as necessary. In some case, boundary wall will be above retaining wall and some cases boundary will be from foundation. The metal post with chain link fencing above brick masonry wall has been proposed to protect the structures such as Sumpwell/ Intake, Office Building, Pumping Stages, Reservoir Sites, Generator House, WTP, Backwash RVT and IC/BPTs etc. as required.

o) Sanitation Components

The sanitation component is considered as an integral part of the water supply project so as to minimize the coverage gap between water supply and sanitation components.The main issues that need to be addressed in the sanitation components as they would have consequential impacts on all the activities are:

- Toilets/Septage/Sludge Management
- Drainage System
- Solid Waste Management
- Institution Building/Strengthening
- Raising Awareness

The sanitation practice is directly related with their hygiene consciousness. The socioeconomic survey shows that there is no separate sewerage system within the proposed service area. But almost, all the households in the urban areas as well as in rural areas have their own latrines with septic tanks. The survey revealed that out of 5998 households, about 53.7% (3222) households have water sealed latrines whereas, 34.4% (2065) households have pit latrines. About 5% (287) HHs have ventilated pit latrines whereas 1% (53) of household are using cistern flush type of pit latrine.

The survey also revealed that there are not any public toilets or institutional toilets within the project town. Hence, the basic sanitation requirement of the proposed project is the construction of public toilets for institution as well as general public for the betterment of facilities in this area. The thrust point will be to avail basic sanitation facilities and declare the whole municipality as ODF. The aim of sanitation is universal coverage. ODF, based on multiple approaches like basic sanitation package, School sanitation and hygiene education program, Community-led total sanitation, School-led total sanitation, Local body-led total sanitation, is considered as the bottom line for program intervention.

There is provision of one institutional toilet & one public toilet under the sanitation components of this proposed project. Similarly, there is also provision of one tractor for solid waste collection. These sanitation components will contribute towards the betterment of sanitation facilities in this area. These facilities also inculcate behavior of toilet use as well as of effective solid waste management among students and the general public. Hence, the proposed project also will address basic sanitation issues through the provision of toilets and solid waste management.

C. Salient Feature of the Proposed Project

The salient features of the proposed project area are tabulated below:

Table 13: Salient Features of the Project

SN.	Items	Description
1	Name of Project	Panchkhal Water Supply and Sanitation Project
2	Type	• Pumping System: Stage 1(Sump Well) to WTP site, WTP site to RVT 10 and to Backwash RVT • Gravity System: From WTP site to RVT 1 to RVT 9 and Distribution System • Gravity System:From Backwash RVT to RVT 11 Kharelthok RVT
3	Study Level	Final Detailed Engineering Design
4	Location Area	
	Province	3
	District	Kavrepalanchowk
	Rural Municipality/Municipality	Panchkhal Municipality
	Service Area Ward and settlement	**Panchkhal Municipality**: **Ward no 2:** Tinkune, Bagaladihi, Dwaredihi, Majhdihi, Takedihi, Ratopahiro **Ward no 3**: Lamidihi, Jantadihi, Kaplidihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok **Ward no 4**: Zero Kilo, Lamidanda, Panchkhal, Purano Bazaar,Tamaghat **Ward no 6:** Dulalthok, Bakhreldihi, Tinpiple Bazar, Ekatabasti, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi **Ward no 7:** Sigrampati, Shikharpur, Jorpiple **Ward no 8:** Khattar, Padalla, Simradi,Kharani(Madi Gau) **Ward no 9:** Bhimsenthan,Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun **Ward no 10:** Nayagau, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar **Ward no 11:** Luitelgaun, Devbhumi, Ojhatar,Karketar, Kharelthok, Jaretar,Bakultar, Ranipani, Serabesi, **Ward no 12:** Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote,Tinghare, Nagbeli, Aapghari.
5	Available Facilities	
	Road	Arniko Highway (Dhulikhel – Panchkhal- Dolalghat-Barahabise)
	Water Supply System	WUSCs
	Electricity	Available
	Communication	Available

SN.	Items	Description
	Health Services	Available
	Banking Facilities	Available
6	Social Status	
	Present HHs Numbers (2018)	5,998
	Present Population (2018)	29,603
	Base Year Population (2021)	31,415
	Design Year Population (2040)	45,768
	Average HHS size	4.94
	Population Growth Rate % (PGR)	2.00
	Projected HHs in Design Year (based on GR)	9,273
7	Water Demand (MLD)	
	Base Year (2021)	3.97 (**3, 973,998 ltr per day)**
	Design Year (2040)	5.79 (**5,789,652 ltr per day)**
8	Source Characteristics	
	Source Name	Sunkoshi River (Seepage Water after Infiltration Gallery)
	Source Type	Snow fed Perennial River (Seepage Water)
	Source Location	WN - 10 of Bhumlu Rural Municipality (At boundary of Panchkhal Municipality, Bimire Dobhan about 2.5km downstream of Dolalghat Bazaar (i e., 2km downstream from the confluence of Indrawati and Sunkoshi river))
	Discharge to be tapped (lps)	84.00 (including filter backwash and 20 hr pumping daily)
8	Type of Structures	
	Proposed intakes	1 set (2 sump well/ intakes with 4 collectors) at Sunkoshi river right bank (WN - 10 of Bhumlu Rural Municipality)
	Water treatment plant	Rapid mixture followed by flocculator followed by sedimentation tank followed by rapid sand filter then disinfection. Total Capacity for 84 lps, at WTP location beside transformer about 200m downstream of Bhimsenthan.
	Pumping Details	All pumps run at a time: Stage 1/ Sumpwell: 4 nos-85HP, Transformer 500KVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 2: 4 nos. 85HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 3: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 4: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 9 of Panchkhal Municipality Stage 5 (WTP site): 2no each 20HP (only one run at a time) for RVT-10 and 2 no each 5HP (only one run at a time) for backwash cum Kharelthok (RVT-11) supply-WN 9 of Panchkhal Municipality
	Ground Reservoir (No and Capacity in CUM)	**From Sump Well to WTP site:** • 1No-150m^3 at each 2nd,3rd & 4th stage of pumping;

SN.	Items	Description
		• 1no @400 m^3 at WTP site • Location: WN 10 of Bhumlu Rural Municipality from Stage 1 to 3 and WN 9 of Panchkhal Municipality for Stage 4 & WTP Site **Service Reservoir** RVT 1: 150 m^3 capacity (WN-3 of Panchkhal Municipality, Thumka Upstream) RVT 2: 150 m^3 capacity (WN-2 of Panchkhal Municipality, Anekot) RVT 3: 150 m^3 capacity (WN-5 of Panchkhal Municipality, Sashastra) RVT 4: 150 m^3 capacity (WN-6 of Panchkhal Municipality, Bakhreldihi) RVT 5: 100 m^3 capacity (WN-12 of Panchkhal Municipality, Radhakrishna School) RVT 6: 100 m^3 capacity (WN-12 of Panchkhal Municipality, Nayagaun) RVT 7: 150 m^3 capacity (WN-10 of Panchkhal Municipality, Jaretar) RVT 8: 150 m^3 capacity (WN-7 of Panchkhal Municipality, Shikharpur) RVT 9: 50 m^3 capacity (WN-9 of Panchkhal Municipality, Bhetwalthok-9N-29) RVT 10: 100 m^3 capacity (WN-9 of Panchkhal Municipality, Palanchowk Bhagwati) RVT 11: 50 m^3 capacity (WN-9 of Panchkhal Municipality, Kharelthok) **Backwash RVT** RVT 12: 150 m^3 capacity (WN-9 of Panchkhal Municipality, (Tapaldanda) **Total storage capacity: 2,300 m^3**
	Pumping Chamber/Sump for pumping	• 3 Compartments at Stage 2 & 3-WN 10 of Bhumlu Rural Municipality • 3 Compartments at Stage 4-WN 9 of Panchkhal Municipality • 2 Compartments at Stage 5 (WTP Site)-WN 9 of Panchkhal Municipality
	Valve Chamber (Bricks/ RCC)	36 Nos
	Pipe valve box	179 Nos
	IC/BPT	6 nos (1 at branch transmission of 50cum, 10cum each at RVT-9 distribution system (1no), RVT-10 distribution system (2nos) and t Kharelthowk distribution system (2nos).
	Office Cum GH (O1) /Guard House (G 1) / Small Guard House (G2) /Dosing House (DS), Generator House, Boundary wall	**At Sump Well (1st stage site):** Small Guardhouse G1-1no; Generator house (140kvA) -1no; Boundary wall **Stage 2,3 & 4 sites**: Small Guardhouse G1 -3nos; Generator house (140 kVA) -3nos; Boundary wall **At WTP Site (5th stage site)**: Medium Guard house G2-1no; Generator house (50kvA)-1no; Dosing Pump House-1no; Boundary wall & Retaining Wall **At Backwash Reservoir Site**: Small Guardhouse G1 – 1no; Boundary wall **At service reservoir site**: Small Guardhouse G1 – 11nos; Boundary wall **Within Service Area (Panchkhal Bazaar Area)**: Office

SN.	Items	Description
		building O1-1no; Boundary Wall
	Fire Hydrant (m)	20
	River crossing (Nos)	12
	Length of Main Transmission	9135.00m
	Length of Branch Transmission Main (from WTP/ storage to RVT 1 to RVT 9 (Gravity), Backwash RVT (Pumping) (Filter Backwash and to supply water to Kharelthok RVT-11 by gravity), RVT-10 (Pumping)	37,237.00m
	Length of Distribution Mains	189,309.00m
	Number of DMAs	11 Nos
	Number of HH connection	5,998
	Number of connections for institution	39
9	**Total Cost of WS Component (Inclusive of all) NRs.**	***1,966,259,486.67***
10	Cost Sharing Arrangement (NRs)	
	GON Component (70 %)	1,376,381,640.67
	TDF Loan (25 %)	491,564,871.67
11	WUSC's upfront (Cash contribution 5%)	98,312,974.33
12	Tariff	
	Up to 6 cum/monthly (NRs)	60.00
	7 to 10 cum/monthly (NRs)	70.00
	11 to 15cum/monthly (NRs)	80.00
	16 to 25 cum/monthly (NRs)	90.00
	Institutional	120.00
	Weighted av. Tariff (NRs. /cum)	83.25
13	Financial Indicators	
	EIRR (Base case), %	18.34
	FIRR (Base case), %	14.75
	AIFC (Base case), NRs per cum	72.35
	AIEC (Base case), NRs per cum	77.34
14	Environment	
	ADB Category	B, Only IEE necessary
	IEE finding	No significant adverse impacts
15	Per Capita Cost for W/S component	
	Per Capita Cost (for base year pop.), NRs	62,589.83
	Per Capita Cost (for design year pop.),NRs	42,961.45
16	Total cost of Sanitation Component (including all), NRs	**8,528,288.39**

SN.	Items	Description
	GON Component (85 %)	7,249,045.13
	Local Authority (15 %)	1,279,243.26
17	**Total cost of Water Supply and Sanitation Component, NRs**	***1,974,787,775.06***

Source: DEDR, 2019

V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Environment and Resources

i. Landforms and Topography

It is an intermontane basin developed in the southeast of the Kathmandu Valley is located within the eastern flank of a synclinorium in Kavre District The project area lies between 27° 39' 0" Latitude and 85° 37' 0" Longitude. The project town lies in the west from the proposed water source Sunkoshi river.Topographically, the project area Panchkhal lies in the Hilly region and Province 3 of Nepal and has altitudes ranging between 585m to 1435m above mean sea level (amsl) with an average altitude of 850 meters.

ii. Geology and Soils

The project area comprises mainly micaceous quartzite, psammitic schist, metasandstone and metasiltstone. The rock masses consist mainly of three to four major joint sets including the joint parallel to foliation. Basically, sand, silt, and clay are the main sediments of the soils of this zone.

iii. Climate

The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. The mean monthly temperature is 24.9°C. The temperature ranges from 11.66°C to 24.9°C. There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The average mean annual rainfall is 1020 mm, which is slightly less than 1500 mm, the average precipitation of Nepal.

The driest month is November, with 7 mm of rain. The rainy season starts from June and ends in September when the monsoon blows across the Bay of Bengal and delivers about 80 % of the annual rainfall. The most precipitation falls in July.The average monthly average rainfall (in mm) is presented in ***Table 14***.

Table 14: Average Monthly Rainfall at Panchkhal (Station no. 1036)

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Average Rainfall (mm)	10	16	29	54	100	194	305	229	191	63	7	18

Source: DHM, 2016

June is the warmest month of the year. The temperature in June averages 26.1 °C. January has the lowest average temperature of the year. It is 13.4 °C. December and January are cooler months with average temperatures of 14ºC and 13.4ºC respectively. The monthly average temperature is presented in ***Table 15.***

Table 15: Average Monthly Temperature at Panchkhal (°C)

Average Monthly Temperature	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
	13.4	15.2	19.9	23.5	25.2	26.1	25.3	25	24.3	22.2	17.7	14

Source: DHM, 2016

There is a difference of 298mm of precipitation between the driest and wettest months. During the year, the average temperatures vary by 12.7 °C.

iv. Water Resources

Sunkoshi is the only reliable surface water source of the project area. Besides this, Jhiku Khola which is the tributary of the Sunkoshi River is also another source of water. However, it is the seasonal river which gets affected by flash flood during rainy season whereas, during summer, it almost gets dry. Similarly, people of the project town also rely on kuwa & stream available within their area.

v. Air Quality

Air pollution is caused by fugitive dust from vehicle movements, particularly over unpaved roads and other unpaved grounds, construction activities, and wind action on unpaved exposed surfaces. Gas emissions generally comes from household cooking, open burning, and moving vehicles. Emissions from these sources are scattered/spread apart, both in terms of locations and timing. Though there is a lack of secondary information on air quality for the project area, the ambient air quality is expected to be within the National Ambient Air Quality Standards of Nepal as there are no such big industries and the traffic volume is also very low.

vi. Acoustic Environment

The sources of noise in the project town are the construction activities and vehicle movement. The anthropogenic noise is confined in few clustered settlements and in market places. Noise levels in the project area are expected to be within permissible standards prescribed by the Ministry of Environment of the GoN.

B. Ecological Resources

i. Flora

The major plant life forms species available in the project area are given in ***Table 16*** below:

Table 16: Plant Life Forms Found in the Project Area

Local name	English Name	Botanical Name	Life Forms
Aasuro	Malabar Nut	*Adhotoda vasica*	Shrub
Aiselu	Raspberry	*Rubus ellipticus*	Shrub
Amliso	Tiger Grass	*Thysanolaena maxima*	Grass
Bakaino	China Berry	*Melia azedarach*	Medium Sized Shrub or Tree
Bans	Bamboo	*BabusaVulgaris*	Grass
Bar	Banyan	*Ficus benghalensis*	Tree
Bot Dhaiyanro	Small Flowered Crape Myrtle	*Lagerstroemia parviflora Roxb.*	Tree
Champ	Golden Michelia	*Magnolia champaca*	Tree
Chilaune	Needlewood	*Schima wallichii*	Tree
Dhale Katus	Indian Chestnut	*Castanopsis indica*	Tree
Dudhe Jhaar	Asthma Plant	*Euphorbia hirta*	Herb
Dudhilo	Willow Leaf Ficus	*Ficus neriifolia*	Tree
Gulaf	Rose	*Rosa rubiginosa*	Shrub
Kafal	Bayberry	*Myrica esculenta*	Large Shrub/Tree
Kalimunte	Crofton Weed/Sticky Snakeroot	*Ageratina adenophora*	Shrub
Kamle	False Nettle	*Boehmeria platyphylla*	Grass
Lajjavati	Shame Plant	*Mimosa pudica L.*	Weed
Lapsi	Hog Plum	*Choerospondias axillaries*	Tree
Paiyun	Wild Himalayan Cherry/Sour Cherry	*Prunus ceratoides*	Tree
Peepal	Sacred Fig	*Ficus religiosa*	Tree
Sal	Sal	*Shorea robusta*	Tree
Sallo	Chir Pine	*Pinus roxburghii*	Tree
Sajivan/Kadam	Oregano	*Origanum vulgare L.*	Herb
Simali	Chinese Chaste Tree	*Vitex negundo*	Shrub
Sisno	Stinging Nettle	*Urtica dioica*	Herb/Flowering Plant
Paulownia	Empress Tree	*Paulownia Tomentos*	Tree
Titepati	Mugwort	*Attermesia vulgaris*	Herb
Uttis	Nepal Alder	*Alnus nepalensis*	Tree

Source: IEE Field Study, 2018

As per the above given table, Sal & Chilaune are found at the lower elevation and Pine, Uttis & Chailaune are found at higher elevation. Earlier, Pine trees used to be the most common trees of the project area which are mostly useful for afforestation. However, pine needles on the ground promote rainwater runoff reducing infiltration capacity thus reducing groundwater recharge. These pine needles do not give good quality compost. The pine trees cannot be used for fodder too. Regarding this, more emphasis are given to the indigenous species like Chilaune, Champ,Uttis, Bakaino, Paiyun & Lapsi. Recently, an exotic tree native to China called Paulownia (Paulownia Tomentos) has been introduced in regard to its greater economic value. Similarly, high value species i.e., Amriso has also been introduced in the project area.

The project area is rich in shrubs and small tree species with medicinal and aromatic values and performs important soil conservation functions. They provide close canopy cover to the ground and thereby prevent losses through surface run-off and soil erosion even during the high intensity of rainfall.

ii. Fauna

Some species of mammals available in the project area is given below.The status of these mammals are as per IUCN & IBAT reports.

Table 17: Mammals in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Herpetes auropunctatus*	Small Indian Mongoose	Nyauri Musa	LC
2	*Macaca mulatta*	Rhesus Monkey	Rato Badar	LC
3	*Felis Chaus/Prionailurus bengalensis*	Jungle Cat	Ban Dhade	LC
4	*Funambulus Pennantii*	Five Stripped Palm Squirrel	Paanch Dharke Lokharke	LC
5	*Canis lupus*	Gray Wolf	Bwanso	LC
6	*Panthera pardus*	Common Leopard	Chituwa	VU*
7	*Rattus Rattus*	House Rat	Musa	LC
8	*Vulpes Bengalensis*	Bengal Fox	Fyauro	LC
9	*Canis aureus*	Golden Jackal	Syaal	LC
10	*Sus Scrofa*	Wild Boar	Bandel	LC
11	*Paguma Larvata*	Masked Palm Civet	Bharse	LC
12	*Cynopterus sphinx*	Greater Short Nosed Fruit Bat	Chamera	LC
13	*Martes flavigula*	Yellow Throated Marten	Malsapro	LC
14	*Semnopithecus schistaceus*	Nepal Gray Langur	Kalomukhe Badar	LC

Source: Field Survey, 2018

According to the local people, local and migratory birds are found within the project area. However, none of these are protected or endangered.Species The commonly found species of birds are given in the table given below:

Table 18: List of Birds in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Acridotheres tristis*	Common Myna	Dangre Rupi	LC
2	*Aethopyga Siparaja*	Crimson Sun Bird	Sipraja Bungechara	LC
3	*Amaurornis Phoenicurus*	White Breasted Water Hen	Sim Kukhura	LC
4	*Ardeola Grayii*	Indian Pond - Heron	Aaskote Bakulla	LC
5	*Athene Brama*	Spotted Owlet	Kochalgaade Latokoshero	LC
6	*Bubulcus Ibis*	Cattle Egret	Bakulla	LC
7	*Columba Livia*	Rock Dove (Blue Rock Pigeon)	Malewa	LC
8	*Copsychus Saularis*	Oriental Magpie Robin	Dhobini Chara	LC
9	*Corvus macrorhynchos*	Large Billed Crow	Kaalo Kaag	LC
10	*Corvus Splendens*	House Crow	Kaag	LC
11	*Lophura leucomelanos*	Kalij Pheasant	Kalij	LC
12	*Cuculus Canorus*	Common Cuckoo	Cuckoo Koili	LC
13	*Cuculus Micropterus*	Indian Cuckoo	Kafal Pakyo	LC
14	*Dendrocopus Macei*	Fulvous breasted Woodpecker	Kaasthakut	LC
15	*Dicrurus Macrocercus*	Black Drongo	Keshraj Chibe	LC
16	*Egretta Garzetta*	Little Egret	Sano Seto Bakulla	LC
17	*Eudynamys Scolopaceus*	Western (Asian)Koel	Koili	LC
18	*Francolinus Francolinus*	Black Francolin	Titra	LC
19	*Halcyon Smyrnensis*	White Breasted Kingfisher	Matikire	LC
20	*Hirundo Rustica*	Barn Swallow	Ghar Gauthali	LC
21	*Megalaima zeylanica*	Brown Headed Barbet	Nyuali	LC
22	*Megalaima lineate*	Lineated Barbet	Kuthurke	LC
23	*Merops Leschenaulti*	Chestnut Headed Bee Eater	Katus Tauke Murali Chara	LC
24	*Milvus Migrans*	Black Kite	Kalo Chil	LC
25	*Motacilla Alba*	White Wagtail	Seto Tiktike	LC
26	*Motacilla Mederaspatensis*	White Browed Wagtail	Khole Tiktike	LC
27	*Parus Major*	Great Tit	Chichilkote	LC
28	*Passer Domesticus*	House Sparrow	Ghar Bhangera	LC
29	*Passer Montanus*	Eurasian Tree Sparrow	Rukh Bhangera	LC
30	*Pavo Cristatus*	Indian Peafowl	Mujur/Mayur	LC
31	*Psittacula cyanocephala*	Plum headed Parakeet	Tuisi Suga	LC
32	*Pycnonotus cafer*	Red-vented Bulbul	Jureli	LC
33	*Saxicola caprata*	Pied Bushcat	Kale Jhyapsi	LC
34	*Saxicola torquatus*	Common Stonechat	Jhekjhek Jhyapsi	LC

S. No.	Scientific Name	English Name	Local Name	Status
35	*Streptopelia orientalis*	Oriental Turtle Dove	Dhukur	LC
36	*Upupa epops*	Common Hoopoe	Fapre Chara	LC
37	*Urocissa flavirostris*	Yellow billed Blue Magpie	Sunthude Lampuchhre	LC
38	*Vanellus cinereus*	Grey-headed Lapwing	Raj Hutittyau	LC

Source: IEE Field Study, 2018

As per *Wikipedia - List of Butterflies of Nepal* based on the list prepared by Colin Smith in 2006, there are 690 species or sub species of butterflies in Nepal. The project area also provides habitats for a variety of butterflies, and during the walkover surveys, various types of butterflies were observed.

The commonly found Herpito-fauna (reptiles & amphibians) observed in the project area are shown in ***Table 19*** given below:

Table 19: List of Herpito-Fauna Found in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Ptyas mucosus*	Rat snake	Dhaman	LC*
2	*Atretium Schistosum*	Olive Keelback Water Snake	Pani Sarpa	LC
3	*T. albolabris*	Green Pit Viper	Hariyo Sarpa	LC*
4	*Varanus Bengalensis*	Common Indian Monitor	Bhainse Gohoro	LC
5	*Calotes versicular*	Garden lizard	Chheparo	LC*
6	*Hemidactylus Flaviviridis*	House Lizard	Mausuli	LC*
7	*Bufo melanostictus/Duttaphrynus Himalayanus*	Common toad/Himalayan Toad	Khasre Bhyaguto	LC
8	*Rana cyanophylectis*	Stream Frog	Bhyaguto	LC*

Source: IEE Field Study, 2018

iii. Aquatic Life

Similarly, the list of common fishes found in the project area is given below in ***Table 20***. These species are found in the nearby water bodies of the project area that includes Sunkoshi River (Proposed Source) and Jhiku Khola.

Table 20: List of Fishes Found in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Garra* Annandalei	Stone Roller	Chuche Buduna	LC
2	*Glyptothorax* Indicus	Catfish	Mungri/Kavre	LC
3	*Heteropneustes fossilis*	Stinging Catfish	Singhi	LC
4	*Neolissocheilus hexagonolepis*	Katli	Katle	LC
5	*Mastacembelus Armatus*	Spiny Eel	Bam	LC
6	*Psilorhynchus Pseudecheneis*	Stone Carp	Tite	LC
7	*Schizothorax Progastus*	Dinnawah Snowtrout	Chuhhe Asala	LC
8	*Channa Gachua*	Dwarf Sankehead	Hile	LC

Source: IEE Field Study, 2018

There will be no significant effects on the lives of fish species as well as fisheries by the proposed project activities..

*Note:
(LC= Least Concern; VU= Vulnerable)
*Note: Though some species fall under VU category, the project activities will not affect the habitat of these species as the construction area does not interfere their habitats.

LC* are the status of the species according to IUCN Red List of Threatened Species however it is not included in IBAT report

iv. Protected Area

The project area is not located in or near any national park, wildlife reserve, conservation area, hunting area, including a buffer zone area, world heritage site, and other protected areas. Hence, there is no possibility of intervention into any of the protected areas by the construction activities of the proposed project.

v. Community Forests

Major project components does not encroach into any of the community forests of the project area. However, some portion of transmission mains pass through the Naule Community Forest . The study shows that there is no requirement of cutting trees. There will also be requirement of clearing of some bushes and shrubs only along the proposed pipeline alignment. Hence, there will be no such significant effect on the community forest.

C. Socio-economic and Cultural Environment

i. Settlement pattern

The settlement pattern of project area is mixed type. The core bazaar area which is located in ward no 7 is dense and populated. Similarly, the settlement pattern of other wards is scattered type due to semi urban and rural in character. The settlement pattern is gradually changing and the rural clusters are developing as market. The rate of migration in to the service area from the surrounding villages and from other districts is increasing during the last few years.

ii. Caste & Ethnicity

The composition of community by caste/ethnic is heterogeneous in nature. So, diversity of culture, custom, tradition, norms and values exists in this project area. The household survey of the sub project area has also reflected the cross section of major ethnic groups of the country.

The survey revealed that Janajati/ethnic (Tamang, Danuwar, Magar, Newar,etc.) are major group comprising of 48.3%(2896) households in the servic area. Similalry, Brahmin/Chhetri are the second largest group comprising of 40% (2402) of total household where as, Dalit and other cast (Madeshi, Musalman etc.) comprising 9.4% (565) and 2.3% (135) respectively. Details of information are presented in the table given below:

Table 21: Distribution of Households and Population by Ethnic Composition

S. No.	Caste/Ethnic Status	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Brahmin/ Chhettri	316	370	277	377	253	29	295	156	115	214	2,402	40.0
2	Janajati	172	99	405	329	168	52	390	68	84	1,129	2,896	48.3
3	Dalit	22	67	45	76	104	3	181	2	2	63	565	9.4
4	Others (Madhesi)	1	60	63	2	3		3		3		135	2.3
	Grand Total	**511**	**596**	**790**	**784**	**528**	**84**	**869**	**226**	**204**	**1,406**	**5,998**	**100.0**

Source: Socio-economic Survey, 2018

iii. Population and Demographic Characteristics

The present permanent population in the service area is 29,603 and the rental population is 960. According to the social survey, there are 5,998 households (HHs) in the proposed service area. The population growth rate of the Panchkhal Municipality of Kavre district is taken as 2%. The growth rate is based upon the population census 1998 to 2011 of Kavre district, Dhulikhel (nearest municipality) and Panchkhal town. The population may increase more in comparison to the present growth rate in that area after availability of water supply facilities in the future. The Table 6 gives brief details on the population growth rate of the project district and the neighboring municipality, Dhulikhel.

The annual growth rate of Panchkhal Municipality is ranging from -2.5% to 1.55% in proposed service area wards. The growth rate is different at each ward as shown in ***Table 23***. The growth rate of the district and neighboring Municipality is compared to establish the growth trend. It is envisaged that the population will be increased than the present scenario after implementation of the scheme. With this assumption and referring NUDS documents, the growth rate 2% is adopted considering that the number of household will be constructed along both sides of major road within design year.

Table 22: Population and Growth Rate

Description	Population	Growth	Population	Growth	Population	Growth	Population
	1981 AD	Rate %	1991 AD	Rate %	2001 AD	Rate %	2011 AD
Kavre District	307150	0.55	324329	1.75	385672	-0.1	381937
Dhulikhel Municipality			9664	1.77	11521	2.17	14283

Table 23: Details of Newly Formed Panchkhal Municipality

Ward	Ward Area (Ha)	Census 2001			Census 2011			Growth Rate	Remarks
		HHs	Pop	P. Densities (PPHA)	HHs	Pop	P. Densities (PPHA)		
1	1079.05	482	2665	2.47	794	3825	3.54	3.68	Not in-service area
2	1373.34	771	4124	3.00	699	3275	2.38	-2.28	
3	392.39	458	2198	5.60	519	2221	5.66	0.10	
4	294.29	606	2998	10.19	796	3498	11.89	1.55	
5	686.67	465	2380	3.47	527	2543	3.70	0.66	Not in-service area
6	588.58	835	4296	7.30	924	4077	6.93	-0.52	
7	588.58	381	1941	3.30	431	2208	3.75	1.30	
8	588.58	519	2528	4.30	539	2405	4.09	-0.50	
9	1177.15	608	3111	2.64	650	2657	2.26	-1.57	
10	294.29	383	2084	7.08	431	1839	6.25	-1.24	
11	1569.53	653	2939	1.87	626	2389	1.52	-2.05	
12	686.67	845	4689	6.83	1147	5299	7.72	1.23	
13	980.96	454	2016	2.06	461	1761	1.80	-1.34	Not in-service area
Total	**10300.00**	**7460**	**37969**	**3.69**	**8544**	**37997**	**3.69**	**0.01**	

Source: CBS, 2001 and 2011

As per socioeconomic survey (2018), the present population in the proposed service area is 29,603 in 5,998 HHs. Out of the total 29,603 permanent population, there are 14,748 male and 14,855 females living in 5,998 HHs. The permanent population of the project area at the end of design period of 23 years (1-year survey year + 2-year construction + 20 years project life) is projected as 45,768 with an average annual growth rate 2%. The rental population is very less i.e. 960 in comparison with permanent population. The water demand for this insignificant rental population is kept in non-domestic demand category.

The population growth rate percentage of the project area is determined based upon population census 1991 A.D., 2001 A.D. and 2011 A.D. of Kavre district, Panchkhal Municipality and possibility of population migration from surroundings in the proposed service area. This has been consulted with WUSC.

iv. Education and Health

Education: There are various educational institutions in the project town. According to the institutional data obtained from the survey, 31 educational institutions including campus for higher education, higher secondary schools , secondary schools as well as primary schools in service area with 8,469 people including students (Total: 7,936, Male: 4,797, Female:3,139) , staffs (Total:55, Male: 32, Female:23) and teachers(Total:478, Male:186, Female:292). Almost of all educational institutions are relying on

ground water, tap water and other sources. All of these educational institutions have water sealed latrines.

Health: Medical facilities for diagonosis and treatments are also available in the service area. There are various local hospitals and health centers in the project area that inludes Sanjeevani Community Hospital, District Community Hospital, Panchkhal UN Training Institution Hospital, Panchkhal Primary Health Center and Baluwa Health Center. Similalry, some poly clinicss, pharmacy and medical shops are also available in Panchakhal Bazaar. For further medical services, most of the people prefer going to Dhulikhel Hospital which is just 17.8 km from the project town.

v. Waterborne and Communicable Diseases

The survey also collected cases of water born diseases such as diarrhea, dysentery, stomach ache and skin disease etc. within the service area. It was found that cases of mortality by water related diseases are nil. The information related to water borne and communicable disease was crossed checked by visiting hospital and health posts within the service area. According to the obtained information, about 3.60% (622) were suffered from diarrhea where as 2.31% (684) were suffered from dysentry. Simialrly, about 2.1%(77) were suffered from other diseasess such as skin, stomach pain, fever etc. In total, about 8 %(2372) of populations are suffered from water related diseases.

vi. Economic Activities

The survey shows that there are various banks, cooperatives, hotels & lodges within the project area that have been boosting the economic activities of the project town. During the course of household survey of project area, the detailed information on the major occupation and economic activities of all household head has been collected. The survey shows that the highest number of population i.e., 72% are engaged in agriculture, whereas 11.45% population depend on business and 9.5% of population in service. Similarly, about 78% and 2% of household head are dependent upon remittance and labour respectively.

vii. Income Level and Poverty Conditions

The survey revealed that main sources of household income of the service area are agriculture, service, remittance and wage labour, respectively. Among the total households, 24.6% have monthly income of more than Rs. (20,001-50,000) and about 38.8% of household have monthly income of Rs. (10,876 - 20,000). Likewise, 3% of hous eholds are earning ore than Rs. 50,000. The study shows that only 11%(659) of households falls under poor category that covers the households with income less than

Rs 7,500 per month.The monthly income of HHs in the service area is given in table below:

Table 24: Income Level of Households by Ward

S. N.	Income Level Range	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	<Rs.7500	25	39	32	127	41	13	191	26	17	148	659	11.0
2	Rs. 7,501-10,875	40	53	146	240	86	33	189	78	50	437	1352	22.5
3	Rs. 10,876-20,000	237	258	217	263	224	27	340	60	67	633	2,326	38.8
4	Rs. 20,000-50,000	193	227	346	132	151	9	134	52	70	163	1,477	24.6
5	>Rs. 50,000	16	19	49	22	26	2	15	10	0	25	184	3.1
	Grand Total	**511**	**596**	**790**	**784**	**528**	**84**	**869**	**226**	**204**	**1,406**	**5,998**	**100**

Source: Socio-economic Survey 2018

D. Existing Situation of the Utilities Associated with this project

i. Existing Water Supply Condition

a) Source to House Connections

There are several existing water supply systems in the new service area. Among them, the major systems are described briefly as follows:

Amarkot Water supply system

There is an existing water supply water system from deep boring system. Altogether there is provision of 40 taps that serves about 700 households. The ground water is extracted through 40m^3 RCC tank (1 no) and Ferro-cement tanks (2 no), each with 20m^3 capacity. Six new tanks are also proposed. This supplies water in ward no.3 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for per tap is NRs. 1000. The tariff collection is well maintained. The average supply hours are two hours each day.

Panchkhal Jal Water supply system

This system supplies water from deep boring system. Altogether, there is provision of 650 taps in this system. The ground water is extracted through RCC tanks-150m^3, Brick Masonry tank- 100m^3 and Ferro- cement tank- 20m^3. This system supplies water in ward no.3 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff is NRs.150 for per 6000 liters and it increases at the rate of NRs 25 per thousand-liter consumption. Initial charge for taps connection is NRs. 6660. The tariff collection is well maintained. The average supply hours are two & half hours in each day.

Bhagawati Temple Water supply system

This system supplies water from lifting system. Altogether, there is provision of 350 taps while other available 50 taps are not in operation. The ground water is fed through stone masonry tank having capacity 50m^3 (1 no) and ferro- cement tank having capacity 20m^3-(4 no) and 10m^3 (2 no) respectively. This supplies water in ward no.9 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for 10000 liters is NRs.350 and it increases with increase in consumption. The tariff collection is well maintained. The average supply is two times in day.

Dhungana Besi Water supply system

This system supplies water via deep boring system. The ground water is fed through 100m^3 RCC tank. This system has been constructed by GON but currently, it is not in operation.

Mayagaun Water supply system

This system had been constructed by UNICEF and had been rehabilitated by FDB in 2044 B.S. and 2065 B.S. respectively. Altogether 15 taps are provided to feed water supply system that serves about 400 household. The ground water is fed through ferro-cement tank having capacity 20m^3 (2 Nos) and 10m^3 (1 Nos) respectively. The existing water supply has proper tariff collecting system. The minimum tariff for each tap is NRs. 3000 annually. The tariff collection is well maintained.

Bakhrel Di Water supply system

Altogether 160 taps are connected to supply water. The ground water is fed through a completely constructed Ferro-cement tank having capacity 20m^3 while another tank with 20m^3 capacity is under construction. The existing water supply has proper tariff collecting system. The minimum tariff for 6000 liters is NRs. 250 annually. The tariff collection is well maintained

Satya Sai Water supply system

This system supplies water via deep boring system. Altogether, there is provision of 118 taps. The ground water is fed through Ferro- cement tank (2 no) having capacity of 20m^3. This system supplies water in ward no 12 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for 8000 liters is NRs. 300. The tariff collection is well maintained.

The survey revealed that largest numbers of household i.e., about 28.86% (1731) and 28.58%(1714) are fetching water from public taps and private taps by various water supply system respectively. Whereas, about 42.56%(2,553) households depend on well/spring/stream/Dhungedhara etc. The survey shows that they use same source of water for all purposes as drinking, cooking, bathing, washing clothes, watering in kitchen garden etc.

There is no provision of water treatment system in all above described existing system as water is directly distributed into small settlements throughout the town through small service reservoirs.

b) Consumption Level

People are using water from stream, kuwa and piped water. The water quality is not good except the piped water. The above-mentioned water supply system supplies water into small settlements and are not well managed. The survey team has collected information related to water consumption level during dry and wet season in the service area. Due to consumption of water from private/public tap & well, spring, and dhunge dhara (stone spouts), the consumption pattern and quantity do not vary between two seasons.

The survey revealed that water consumption level of each household is found to be 260.6 liters per day and the total time spent is about 49.6 minutes (per trip about 6.4 minutes) to fetch water. Similarly, the total trip to be carried out for fetching water is about 7.7 trips daily. The per capita per day consumption is about 52.43 liters per day.

c) Operation costs and current Tariff

There are several existing piped water supply system. In addition, the communities depends upon stream and spring water. The communities are willing to pay handsome amount for the piped water supply service they may receive through the proposed project. They are also aware of the quality of supplied water. Hence, the community is ready to pay the water tariff that will be reasonably fixed by the concerned committee.

Now, they are fetching water through stream and kuwa, where the tapped aquifer is easily susceptible to pollution and contamination. As there is hardship of water during dry season and the quality of water is not good, they are ready to pay the tariff to any extent. Their main & only demand is to get water in sufficient quantity.

Different water tariffs are allocated in the existing systems. The minimum tariff is NRs.150 for per 6000 liters and it increases at the rate of NRs 25 per thousand liter

consumption. The minimum tariff for 10000 liters is NRs.350.The minimum tariff for 6000 liters is NRs. 250 annually. The minimum tariff for 8000 liters is NRs. 300.

d) Problems of the Existing System

The problems of the existing water supply system in Panchkhal Municipality are as follows:

- The existing system is an old system, and the available water infrastructures are not sufficient to meet the current water demand.
- The water source is not sufficient to meet the present water demand of the service area. The water shortage is acuter during the dry season;
- There is only an intermittent supply of water. The present system capacity is not sufficient to meet the water demand of the population;
- The existing system supplies water without treatment. Therefore, the existing system has not been able to deliver water quality conforming to NDWQS standards especially turbidity during rainy season;
- WUSC has not been able to extend the distribution system to new areas where the demands of water exist.

ii. Existing Sanitation Situation

a) Sanitary Facilities

The survey shows that about 53.7% (3222) household have water sealed latrine where as 34.4% (2065) household have pit altirne. About 5% (287) have ventilated pit latrien where as 1% (53) of household are using cistern flush type of pit latrine. The table below gives the information regarding the availability of the latrine facility within the project area.

Table 25: Coverage of sanitary facilities

Type of Toilet	Ward #										Total	%
	2	3	4	6	7	8	9	10	11	12		
No Toilet	34	35	35	43	60	5	91	6	3	59	371	6.2
Pit Latrine	1	493	120	7	6	2	114	4	1	1317	2065	34.4
Ventilated Pit Latrine	5	14	1	38	2	10	158	38	2	19	287	4.8
Water Sealed	470	54	630	689	428	67	499	176	198	11	3222	53.7
Cistern Flush	1	0	4	7	32	0	7	2	0	0	53	0.9
Grand Total	511	596	790	784	528	84	869	226	204	1406	5998	100.0

Source: Socio-economic Survey 2018

b) Drainage Facilities

The service area has roadside drains along Araniko highway but these drains are not maintained properly. Most of the parts of service area has not been facilitated with drainage facilities. It has been reported that major problem occurs during monsoon due to the insufficient capacity of surface drainage to drain out the run off water that comes from the upstream hill forest to the town. The Panchkhal bazaar gets flooded if the rainfall continues for more than 4-5 hours. This is due to the bed level of Jhigu khola and level of settlement areas. The roadside drains are situated along the blacktopped road. WUSC is much more enthusiastic for the construction of combined sewer and committed for necessary contribution.

c) Wastewater Management Practices

There is no sewerage system in the proposed service area. Almost all households in the urban areas have their own latrine with septic tanks. Similarly, private toilet with septic tank has been constructed in some households in rural area also. Such toilet with septic tank has been constructed in more than 61% HHs of service area. Hence, it is concluded that the people of the service area are much more aware in sanitation.

d) Solid Waste

The survey revealed that 83% of households are disposing domestic solid waste in the pit near to the house whereas 5.3% of household disposing their wastes by private collector. It was observed that the respondent have sufficient knowledge about the improperly managed solid waste that may affect the public health and surrounding environment. The detailed information are given in the table below:

Table 26: Existing solid waste management practices

S.N.	Waste Management Practice	Ward										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Pit Near to House	15	36	10	1	14	4	68	5	18	78	249	83.0
2	Private Collector	1	1	7	0	0	0	7	0	0	0	16	5.3
3	Pit/Container managed by VDC/Municipality	0	4	14	1	5	0	1	0	1	0	26	8.7
4	Others	0	2	2	1	2	0	0	0	2	0	9	3.0
	Grand Total	16	43	33	3	21	4	76	5	21	78	300	100.0

Source: Socio-economic Survey 2018

iii. Water Supply and Sanitation User's Association

The Panchkhal Water Supply and Sanitation Committee consist of eleven members representing from various clusters within the service area. The executive committee consists of 8 male and 3 in female members and one female member has been working

as position of treasurer in key executive post of WUSC. According to the caste/ethnicity status of WUSC body, Brahman/Chhetri and Janajati groups occupy 4 and 7 respectively. The separate WUSCs are operating existing system, but some of them are in new WUSC. The Name list and position of the WUSCs are given in the table given below:

Table 27: Name List and Position of WUSC in Panchkhal WSSP

S.N.	Name	Position
1	Mr. Kumar Prasad Lamichane	Chairman
2	Mr. Rabindra Sipkhan	Vice Chairman
3	Mr. Chet Prasad Gautam	Secretary
4	Ms. Jhal Kumari Dulal	Treasurer
5	Ms. Laxmi Danuwar	Member
6	Mr. Rabindra Sithaula	Member
7	Mr. Bharat Shrestha	Member
8	Mr. Shiv Bahadur Sapkota	Member
9	Ms. Sarita Sahi Tamang	Member
10	Ms. Maili Danuwar	Member
11	Mr. Shyam B.K.	Member

Source: DEDR,2019

The WUSC is registered as per water resource act 2049 and drinking water laws 2055. The number of members of WUSC is as per STWSSSP/PMO guideline.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION/AUGMENTATION MEASURES

The anticipated environmental impacts are mainly categorized into two viz., Beneficial Impacts and Adverse Impacts on the basis of its negative and positive significance. This is then further categorized into four impacts that includes i) Impact on Physical Environment, ii) Impact on Biological Environment, iii) Impact on Chemical Environment and iv) Impact on Socio-economic Environment, based upon the effects on the existing environment. These impacts are sub divided into three categories based upon the project phase that includes i) Design Phase, ii) Construction Phase and iii) Post Construction (Operation & Maintenance) Phase. These impacts are discussed below in detail.

A. Beneficial Impacts

The development of water and sanitation facilities will have numerous beneficial impacts on individuals as well as to the entire community. Availability of clean and adequate drinking water and sanitary facility are basic human needs. Also, any development efforts aimed at improving water and sanitation needs of an area will significantly contribute towards improving the quality of life of that area. Some of the major beneficial impacts of the project are categorized below:

i. Impact on Socioeconomic Environment

a) Construction Phase

1) Employment Generation

The project will generate direct employment opportunities to the local people of the project area. The construction activities of the proposed project will offer the locals a grand opportunity to be engaged in the proposed project activities as either v skilled or non-skilled workers in terms of their proficiency. The main target group for this benefit is People relying on daily wages. The socioeconomic survey shows that 2.77% of total (5998) households have to rely on daily wages. Hence, this project will be beneficial to this 2.77% of total households. The amount of money earned by the local people will somehow increase the local economy thereby reducing the chances of seasonal migration of the local people depending upon daily wages works to survive. To augment such benefits, priority will be given to employing local laborers as far as possible.

The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

The enhancement measures for this impact include;

- Recommend contractor to employ local people by giving high priority to women and under privileged group as far as possible.
- Ensure equity in provision of wages to both male as well as female labors.

2) Skill Enhancement

The construction of the project will not only provide direct employment opportunities but also ensure the transfer of skills and technical proficiency to the local workforce. The project activities such as construction of intakes, treatment plant, valve chambers, buildings, public toilets etc. will provide transferable skills. In future, these skills will be a plus point for the locals in any relevant work as such. Hence, this benefit is targetted to the local people relying on daily wages and those to be involved in labor works of this proposed project.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The enhancement measures for this impact include;

- Making a proper work plan and code of conduct during the construction period.
- Provision of regular hands on training to the workers during the project construction period

3) Local trade and business opportunity

The proposed project will directly add in building business opportunity within the area. As construction work involves a lot of human resources, some grocery stores and, agriculture and livestock product will gain a momentum in the vicinity of the construction site. This will boost the local trade and business sector. Similarly, procurement of locally available construction materials will also help to improve the local trade and business opportunity. The main target group for this beneficial impact is local people involved in local business sector. The socioeconomic survey shows that about 11.45% (687) and only 0.78% (47) of total 5998 HHs are involved in business and industry sector respectively. Though the target group quantity is not so significant, the enhancement of local trade & business opportunity will be fruitful to these people. This will further boost the local trade & economy.

The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

The enhancement measures for this impact include;

- Recommend contractor to give priority to the local products during procurement of construction of materials.
- Priority also will be given to local services like grocery stores, tea shops, hotel & restaurants etc. during the entire construction period.

b) Operation Phase

1) Improved health and hygiene

Deteriorating water quality and unsanitary conditions are often the causes of waterborne communicable diseases. The socioeconomic survey revealed that the cases of waterborne diseases such as diarrhoea, dysentery, stomach ache and skin disease etc. are found very few in numbers. Similarly, cases of mortality by water related diseases are nil. However, it is not certain that this condition will be well maintained in the future too. The provision of water treatment plant under the proposed project components will provide solution to this uncertainty. After the implementation of the project, easy access to safe & potable water will maintain the health & hygiene of the local people. This will also help to reduce the chance of occurrence of water-borne communicable diseases within the project area in the future. This will also help them in bringing a decrease in medical expenses that may require to be incurred if any incidence of water borne diseases is observed. As this proposed project aims to provide safe, reliable & potable drinking water to the proposed service area of the project town, the main target group of this beneficial impact will be beneficiaries or people residing in the service area of this proposed project.

The impact is thus direct in nature, local in extent, high in magnitude and long-term in duration.

The enhancement measures for this impact include;

- Regular maintenance of the water supply components should be done so that the project operates smoothly and the benefits are intact.

2) Increased economic opportunity

Reliable Water Supply System is one of the most important infrastructures for the urban development. Hence, this proposed project will increase rural-town migration due to availability of better infrastructures. This will boost economic level of the town. The increased economic level may increase the value of the land, thereby uplifting the economic status of the local people.

These benefits can be maximized by ensuring regular maintenance of water supply and sanitation components and by promoting land development activities in the area. The main target group for this beneficial impact will be people of the service area involved in business & industry.

The impact is thus indirect in nature, local in extent, medium in magnitude and long-term in duration.

The enhancement measures for this impact include;

- Ensuring regular maintenance of the water supply components
- Promoting urbanization through proper land development activities in the area.

3) Social Empowerment

Social Empowerment refers to the process of self empowerment enabling to overcome the sense of powerlessness in the society. This covers Gender Equity, Women's Participation and Social Inclusion. The proposed project will be able to enhance this social empowerment through various capacity building programs. Gender Inequality that is still prevailing within the project town is expected to be eliminated through the implementation of the proposed project.

The scoioeconomic survey revealed that major household works such as cleaning of houses, washing clothes, child care, cooking, rearing animals, and fetching drinking water is considered as work of women. As per the sampled household survey carried out in 2018, 65% of female are observed to be involved in water fetching & storage and 35% of male are observed to be involved in this activity. This indicates that women are more responsible for fetching water in comparison to the men. As the proposed project aims to provide water supply service to each household through private connection, easy access to safe & potable water through the implementation of this proposed project will contribute towards their betterment. It is because the time that may be spent for fetching water will be saved and could be utilized in various other activities. The improved water supply system will contribute towards their better health and hygiene through the provision of safe & potable water. This will in turn ensure the maintenance of health & hygiene of other family members as the sampled survey also shows that 60% of female are involved in taking care of family members especially children and senior citizens.

The proposed project also encourages women participation in the project related activities by enforcing at least two women in water user's committee. As per the *Table*

28 given above, three female members are appointed as members of Panchkhal Water Supply Users & Sanitation Committee among which three female members are appointed as General Members. Their involvement in WUSC will boost their confidence and decision making ability. Similarly, it will also provide them opportunity to actively participate in meetings, discussions and many other relevant programs.

The socioeconomic survey revealed that in comparison to men, women have much more work load regarding household activities as the gender inequality is still existing in emerging urban areas like Panchkhal Municipality. Hence, women of the project area are mostly entangled within the household activities. The involvement of women members in WUSC will be the exemplary effort to encourage other women to come out of the cocoon within which they have been entwined by household activities for decades and isolated from the scoiety. The proposed project will also give emphasis on various activities like stakeholder consultations, meetings etc. to persuade women to actively partipate in project related activities.

The proposed project also expects to enhance the condition of underprivileged people (Dalits & Poor People) by making them involved in various programs organized under the proposed project. Hence, this proposed project has also prioritized Social Inclusion.

The impact is indirect in nature, local in extent, low in magnitude and long-term in duration.

The enhancement measures for this impact include;

- Prioritize the vulnerable groups in WUSC along with female groups.
- Involving underprivileged group of people especially women and poor people in various capacity building programs and project related community meetings

Overall, the Subproject will lead to improved public health and environment, significantly improving the quality of life of Panchkhal town residents.

The following given table shows the significance of the impacts based on the scoring that has been taken from National EIA Guidelines, 1993.

Table 28: Summary of Impact Matrix of Beneficial Issues of the project

Beneficial Impacts	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
Construction Phase					
Employment Generation	D	H (60)	L (20)	ST (5)	Very Significant (85)
Skill Enhancement	ID	M (20)	L (20)	LT (20)	Very Significant (80)
Local Trade and Business	D	M (20)	L (20)	LT (20)	Very Significant (80)

Beneficial Impacts	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
Operation Phase					
Improved Health and Hygiene	D	H (60)	L (20)	LT (20)	Very Significant (100)
Increase Economic Opportunity	ID	M (20)	L (20)	LT (20)	Very Significant (80)
Women empowerment	ID	L (10)	L (20)	LT (20)	Significant (50)

Source: National EIA Guidelines, 1993 & IEE Study 2018/019

Note: Scoring is done based on following;

Nature of Impact: D = Direct; IN = Indirect;

Magnitude, H = High (60); M = Medium/Moderate (20); and L = Low (10)

Extent, R = Regional (60), L = Local (20); and S = Site-specific (10)

Duration, LT = Long-term (20), MT = Medium-term (10); and ST = Short-term (5)

The points/scoring are taken from the National EIA Guidelines, 1993

Significance of Impact

Total Score: More than 75 : Very Significant

50-75 : Significant

Less than 50 : Insignificant

B. Adverse Impacts

i. Impacts on Physical Environment

a) Design Phase

1) Soil Erosion & Slope Instability

During design phase, there is possibility of incorporation of sloped areas due to which construction activities in such area may result in soil erosion and slope instability.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Incorporate measures and sites for handling excessive spoil materials
- Incorporate drainage plan in final design

b) Construction Phase

1) Soil Erosion & land surface disturbance

Excavation and digging of trenches during construction has the potential to cause erosion and cave in thereby causing soil erosion, silt runoff and unsettling of street surfaces. Unorganized disposal of the excavated earth can disturb the street surface and decrease the value of the area where it is disposed. The activity as such will be a discomfort to the road users and inhabitants.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Protecting the foundation from damage during backfilling
- Using the right backfill materials
- Compacting the backfill
- Final finishing the subgrade to ensure that water drains away from the foundation

2) Spoil Disposal & Gully Erosion

Inappropriate disposal of spoils from the construction activities may result in gullying and erosion of spoil tips especially when it is combined with unmanaged surface water runoff. This leads to destruction of vegetations, damage to agricultural lands and destruction to private property. This will affect the people possessing those agricutural lands as well as the anticipated properties.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Follow Spoil Management Plan as included in ***Annex E***.
- Use of excess Spoil or Soil for filling depressed areas or borrow pits wherever possible.
- Appropriate disposal of Spoil at the designated places.
- Spoils should not be disposed on natural drainage paths, canals and other infrastructures.
- Provision of toe walls and retaining walls to protect the erosion of disposed spoils.

- Provision of proper drainage, vegetation and adequate protection against erosion at the Spoil Disposal Site.

3) Air Pollution

There will be greater impact on air quality from the inadequately managed or haphazard project activities that includes: (i) earthworks such as clearing, grubbing, excavations, and drilling especially during dry seasons; (ii) demolition works; (iii) stockpiling of natural aggregates, excavated materials and spoils; (iii) transport, loading and unloading of natural aggregates; (iv) movement of construction-associated vehicles; (v) on-site rock crushing and concrete mixing; (vi) burning of firewoods for cooking & heating in work and labour camps and (vii) open burning of solid waste by workers.

These activities may increase dust, carbon, monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons in the air. This will affect the construction workers, people residing in this area and the passers by.

The impact is indirect, local to regional in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Strict Prohibition of open burning of solid waste
- Watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary;
- If re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces;
- Use of Construction/ Transportation Vehicles complying with NVMES,2069
- Regular inspection & maintenance of construction/transportation vehicles
- Supply of clean cooking fuel to workers instead of allowing them to use firewood for cooking

4) Noise Pollution

Noise-emitting construction activities include earthworks, rock crushing, concrete mixing, demolition works, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise impact will be high in areas where noise-sensitive institutions such as healthcare and educational facilities are situated. This will affect the construction workers, people residing in this area and the passers by.

The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Restricting noisy activities to daytime and overtime work to avoid using noisy equipment;
- Prohibit the use of pressure horn by transportation vehiles
- Regular inspection & maintenance of construction/transportation vehicles to ensure the use of Vehicles complying with NVMES,2069 B.S.
- Regular inspection & maintenance to ensure the use of equipments/machinery that comply with applicable emission standards of GoN i.e., National Noise Standard Guidelines, 2012
- Regular inspection & maintenance to ensure the use of Diesel Generators complying with National Diesel Generator Emission Standard,2012

5) Generation of solid waste & waste water from construction sites and worker's camp

During construction phase, generation of solid waste & waste water from the construction sites and workers camp are likely to create nuisance in the surroundings. Soil runoff from the construction site may lead to off-site contamination (particularly during rainy season). Similarly, Improper disposal of construction debris may lead to off-site contamination of water resources. Unmanaged solid waste &effluent from workers camp may contaminate the surroundings. This will affect the construction workers, people residing in this area and the passers by.

The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

a) Construction Wastes

- Adopt 3R (Reduce, Reuse & Recycle) concept
- Ensure storage areas are secure, safe & weatherproof.
- Management of reusable wastes
- Sale of Recyclable wastes to scrap dealer
- Final Disposal of Bio degradable solid wastes
- Avoid over ordering of construction materials to the extent possible. This will be challenging, as it requires strong coordination with the concerned contractors, as it

cannot be made mandatory. However, it is not impossible too to coordinate with the contractors in this regard.

- Use standard size & quantity of construction materials.
- Construct garland drains to reduce the runoff from the stockpiles.

b) Solid Wastes, Wastewater and Sewage from labour camp

- Adopt Segregation of Solid Waste (3R Concept) based on being biodegradable or non-biodegradable. It is because decomposers cannot break down non-biodegradable wastes and their disposal poses a big problem.
- Manage biodegradable wastes that include food waste, paper waste, biodegradable plastic, etc. by any suitable processes that include Composting & Incineration. If these two processes are not possible then, the wastes shall be managed either by handing over these wastes to the municipality waste collectors who will finally dispose those wastes to the landfill sites of the project town or by disposing those wastes to the burial pits at suitable place.
- Non-biodegradable wastes like glass, plastics & metals shall be managed by reusing them for site use or selling them to scrap dealers instead of disposing them
- Strict Prohibition on open incineration of solid wastes & use of plastic materials to minimize the quantity of plastic wastes
- Construction of the temporary latrines with temporary soak pits & septic tanks within the campsite for proper disposal of sewage
- Provide temporary but proper drainage system for proper outlet of waste water generated from cooking practices adopted by the workers
- Employ local people from nearby villages to maximum extent possible. It will minimize the number of workers residing at worker's camp. Lesser the number of people, lesser will be the solid waste & effluent generated. However, it cannot be made mandatory because availability of local people with required skills will not be ensured at the time of construction.

6) Accidental Leakage or Spillage of Stored Fuel/Chemicals

During construction phase, there will be requirement of storage of fuel/chemicals. During the process of storage and handling process, there is possibility of accidental leakage or spillage of stored fuel/chemicals. If not removed quickly, the spilled chemicals/fuel may be absorbed by the floor.This may lead towards the contamination of soil & water. This will affect the community living around this area.

The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

- Provision of well managed storage site
- Organize awareness programs for the workers responsible for handling fuel/chemicals
- Supervise workers to handle fuel/chemicals properly
- Use of spill kit materials to block flow and prevent discharge to nearby water bodies
- Scatter the Sawdust, sand or dry soil over the area of spill and leave for few minutes to soak up the fuel/chemical. So, availability of saw dust, sand or dry soil should be ensured in the store
- Regular Inspection Visit to the storage site to inspect the leakage of the stored container of fuel/chemical

7) Impact on Land Use Pattern

The construction of the proposed project components will occupy significant area of the land within the core area. This will affect the current land use pattern as the land to be used for the construction of these components could be used for other purposes like agricultural, residential etc. This effect will be direct in nature.

As the construction works of the proposed project start, there will be possibility of influx of people from the nearby areas of the project town to this project town. This will in turn increase the population of the project area which may lead towards change in land use pattern within the core area in haphazard manner. Arable land may be converted to settlement areas. Unstable land may also be used for planned areas. Hapazard cutting of sloped areas may be done to increase settlement areas. The unmanageable land is the main reason behind the destruction of the environment.The effect will be indirect in nature.This will be affecting the people residing within the core area of the project.

The impacts are both indirect & direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

- Selection of barren and public land only for the construction of project components.
- Avoid the acquisition of private and agricultural land for the construction of project components.
- Monitoring on the haphazard land use & planning by the concerned authority.

8) Disruption to Natural Drainage

The pipe laying works along ROW of the public road within the service area of the proposed project may disrupt the existing natural drainage system as the natural drainage flow may be interfered by the construction activities that includes earthworks, backfilling,stockpiling etc.This can have significant consequences like Localised Flooding, Channel Erosion, Landslides etc affecting the residents of that area.

The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact are as follows:

- Avoid the natural drainage pathways for pipe laying works.
- Stockpile the excavated materials at safe but nearby place.
- Restore natural drainage system if the drainage system during construction is blocked.

9) Haphazard Disposal of Dismantled Debris

The proposed project also involves dismantling activities for rehabilitation of existing intakes, for pipe laying works and other miscellaneous works. This will result in the generation of dismantled debris.

Similarly, after the completion of construction works, the temporary facilities like labour camps, stockpiling sites, temporary toilets etc. needs to be dismantled immediately. The dismantled properties in the form of debris if not properly and instantly disposed off, may create nuisance in the surroundings. This may degrade the environmental quality. This will affect the people living nearby the haphazardly disposed places and even the construction workers also.

The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

- Immediate Response on handling of dismantled debris.
- Segregation of Dismantled Debris
- Adopt 3R (Reduce, Reuse& Recycle) concept
- Sale of Recyclable Wastes to Scrap Vendors/Dealers

ii. Impacts on Biological Environment

a) Construction Phase

1) Impact on Flora & Fauna

Major project components does not interfere any of the forest areas. Hence, there will be no such effect on the existing flora & fauna. However, there may be requirement of clearing of some bushes and shrubs along the proposed pipeline alignment i.e, from sump well to WTP sites as some portion of transmission mains pass through the Naule Community Forest area. The study shows that there is no requirement of cutting trees. Similarly, during pipe laying works, some of the top soil may be lost. As some portion of transmission mains pass through vegetated areas, during pipe laying works, the noise of construction activities may affect the faunas living nearby these areas.

Haphazard site clearing, parking, and movement of construction vehicles and equipment, stockpiling will result in unnecessary loss of vegetation & fauna beyond Project footprints.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Replace the excavated top soil to its original position after the completion of pipe laying work
- Re-vegetating disturbed slopes and grounds, as applicable;
- Awareness programs regarding policy related to the conservation of existing flora & fauna, to the workers prior to the construction and the community during various meetings and discussion programs
- Adopt the suitable mitigation measures proposed to minimize noise pollution as mentioned earlier
- Regular Monitoring

2) Impacts on Aquatic Life

During construction phase, nearby water bodies may be used by the workers for their daily activities like waste disposal, sanitation activities which may pollute the river quality which in turn lead the habitat of aquatic life towards risk.

Similarly, the construction works for the proposed sump wells may also contaminate the quality of exisitng & proposed sources affecting the aquatic habitat.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include;

- Strict Monitoring on the daily activities of workers and Prohibition on disposal of wastes to the water bodies during construction works at source area.
- Provision of temporary but well-equipped toilets
- Restriction to workers from fishing
- Adopt measures mentioned above for the solid waste management

3) Forest Fire

As the study shows that some portion of main transmission pass through the community forest, during pipelaying works, there is greater possibility of accidental forest fire that can be due to either carelessness of workers or other sudden accidental causes. This forest fire in turn will result in various consequences that includes impact on flora & fauna, destroying of nutrients by the ashes, soil erosion etc.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Prohibition on burning dry grass or debris;
- Prohibition on camp fires & smoking within the forest area to the workers;
- Keeping fire fighting equipment stand by within the construction sites;
- Provision of safety trainings regarding forest fire to the construction workers prior to construction.

4) Forest Encroachment

During pipe laying works, there will be regular inflow & outflow of the construction workers and other people related to the project construction to the forest area. This may result in possibility of encroachment of forest area. This will have direct impact on flora & fauna as their habitat will be disturbed by the forest encroachment. This will also discourage the ability of the forest vegetation to recover. Workers involved in the construction activities may use firewood of the forest areas which is illegal in actual.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include:

- Strict & Regular Monitoring during the entry of workers for the construction workers,
- Mobilization of the concerned community forest groups,
- Legal Provision along with imposing fines as punishment for those responsible for forest encroachment ;and,
- Provision of trainings to the construction workers to provide support in controlling encroachment.

b) Operation Phase

1) Impact on Aquatic Life

The effluent produced from the filter backwashing, if discharged directly into the nearby water bodies, may pollute the water bodies endangering the existence of aquatic lives . This impact will be more troublesome during dry season when the flow will be less and self-cleansing capacity of the river will be less.

The impact is thus direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include:

- Direct discharge of the raw sludge to the water bodies will be discouraged through strict monitoring to the operators involved
- Proper Implementation of Water Safety Plan (WSP)

iii. Impacts on Chemical Environment

a) Construction Phase

1) Impacts on Water Quality of the nearby rivers

During construction phase, there is high possibility of water resources like Jhiku Khola and Sunkoshi River to be polluted due to the chance of disposal of solid wastes by the workers and poor sanitation behavior of the workers. This will lower the water quality of these water bodies.Polluted water bodies will be detrimental to aquatic life as well as to the health of people relying mainly on the river and streams as sources of water for drinking and other domestic uses.

Similarly,some sections of the distribution pipeline will cross water bodies, exposing these resources to risks of pollution caused by poorly managed construction sediments, wastes and hazardous substances**.**

The impact is direct in nature, local to regional in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Provision of Septage Disposal through construction of toilets with septic tanks
- Disposing of spoils or excess soils as free filling materials as soon as possible
- Locating temporary storage areas on flat grounds and away from main surface drainage routes;
- Shielding temporary storage areas with sandbags
- Adopt measures mentioned above for the solid waste management
- Provision of adequate water supply and sanitation facilities at work sites.
- Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly.

b) Operation Phase

1) Impact on Quality of Water Stored in Reservoir

Irregularity in the supervision of the operation of distribution system may lead to excessive algae growth in service reservoir which may produce toxins reducing the water quality within the reservoir and this may cause serious illness in humans consuming water. The algal growth may also impart earthy taste & odor.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Proper Implementation of Water Safety Plan (WSP).
- Removal of Algae grown within the reservoir at regular intervals by the operating team deployed by the WUSC.

2) Impacts on Water Bodies

The sedimentation tank requires periodic cleaning through periodic removal of sediments settled down (Raw Sludge) at the bottom of the tank. The removed sediments or sludge from sedimentation tank needs to be properly disposed. But, there is high chance of disposal of sludge directly into the nearby water bodies. This will

degrade the water quality of the river. This impact will be more troublesome during dry season when the flow will be less and self cleansing capacity of the river will be less.

The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact are as follows:

- Disposal of raw sludge to the appropriate landfill sites of the proposed project town
- Use of raw sludge as compost for agricultural land
- Avoid direct discharge of the raw sludge to the water bodies through strict monitoring to the operators involved.
- Proper Implementation of Water Safety Plan (WSP).

iv. Impacts on Socioeconomic Environment

a) Design Phase

1) Structural Instability

Panchkhal municipality belongs to hilly region hence, it is prone to seismic activity. As per report on Socio-Demographic Impact Study on Nepal Earthquake 2015 prepared by CDPS (TU), the project district, Kavre is highly affected by the massive earthquake that shook various parts of Nepal in April 25, 2015. If certain seismic activity again occurs in the future, this may result in cracking of structure leads to facility failure and public discomfort. Though this impact will be experienced during operation phase, this should be considered during design phase so that such possibility of structural failure can be reduced to greater extent through safe design of earthquake resistant structures.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include:

This impact can be mitigated through proper design of earthquake resistant structures as per standard and code of practice.

PMO, RPMO & DSMC are the main responsible bodies for the adoption of this mitigation measure.

2) Health & Safety of Community & Workers

During design phase, if the project components are designed without focusing on the health & safety of community & workers, it will have greater impact on socio-economic environment.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include:

- Training on Community Health & Safety Hazards by DSMC by disseminating information about this through training manuals, photographs & documents related to safety.
- PMO, RPMO & DSMC are the main responsible bodies to carry out the above-mentioned mitigation measures.

3) Damage to the existing facilities

During construction phase, if the proposed pipelines interfere any of the existing utilities, there is greater possibility of those utilites getting damaged. This will create discomfort to the people getting facilities from those damaged utilities. Similarly, there is also possibility of some fraud people to take advantage of this impact and may make false claims for damaged utilities. Though this problem appears during construction phase, its mitigation measure should be considered during design phase. Hence, this impact is categorized for design phase.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Coordinate with the concerned agencies to finalize the pipe network layout to avoid damage to the existing utilities.
- Design & Locate pipelines away from existing utilities during design as far as possible.
- Provide budget for restoration/replacement of damaged utilities.
- Photographs of construction sites before and after the construction to avoid the false claims.
- Prompt Reinstatement of paved as well as unpaved roads after completion of excavation works for pipe laying.

b) Construction Phase

1) Community Health & Safety Hazards

Overall, communities will be exposed to cross-cutting threats from construction's impacts on air and water quality, ambient noise level; mobility of people/goods/services; accesses to properties/economic activities/social services; service disruptions, etc. Communicable and transmittable diseases may potentially be brought into the community by construction workers.

The impact is indirect in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Contractor's implementation of EMP
- Adequate lighting, temporary fence, reflecting barriers and signage at active work sites;
- Contractor's preparedness in emergency response;
- Adequate dissemination of GRM and Contractor's observance/implementation of GRM

2) Worker's Health & Safety Hazards

Workers will also be exposed to the cross-cutting threats of the impacts above during construction. Inadequate supply of safe/potable water and inadequate sanitation facilities to the worker's camp; poor sanitation practices on site; poor housing conditions; the handling and operation of construction equipment; handling of hazardous substances; exposure to extreme weather and non-observance of health and safety measures, pose additional threats to the health and safety of construction workers. Construction workers may also be potentially exposed to communicable and transmittable diseases in the community and the workforce.

The impact is indirect in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Comply Labor Act (1992) of GoN
- Train all site personnel regarding environmental health and safety as like in design phase by DSMC & Contractors

- Provide Personal Protective Equipment (PPEs)to workers that includes protective clothing, helmets, goggles and other equipment designed to protect the wearer's body from injury or infection and ensure their effective usage
- Require workers to wear high visibility clothes
- Exclude public from worksites
- Maintain accident reports and records.
- Make first aid kits readily available
- Maintain hygienic accommodation in work camps
- Ensure uncontaminated water for drinking, cooking, and washing,
- Assure clean eating areas
- Make sure sanitation facilities are readily available
- Provide adequate space and light to the camp site
- Adequate supply of potable water to the camps and good sanitation within camps
- Provide medical insurance coverage for workers
- Provide orientation for guest visitors
- Ensure that visitors do not enter hazard areas unescorted;
- Ensure moving equipment is outfitted with audible backup alarms;
- Hearing protection equipment enforced in noisy environment
- Chemical and Material storage areas need to be marked clearly

3) Traffic Congestion

The road from Dolalghat junction to Majhi Gaon may be susceptible to traffic congestion during transportation of construction materials as well as pipeline laying works as the pathway to the proposed sump well site falls within this roadways and this is a bit narrower that may provide discomfort to the passer-by & shopkeepers and may obstruct the daily activities of the people living in that area .

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- The trench for pipeline should not be abandoned and the contractor should be recommended to backfill the trench immediately followed by compaction right after completion of pipe laying works.
- The contractor will be accountable to provide signage at appropriate locations indicating available alternate access routes to minimize traffic disruptions.

- The contractor will have to provide access to shops and residences using simple wooden walkways.
- Provision of alternative way for vehicular movement and pedestrians if possible
- The contractor shall follow the Traffic Management Plan especially at Bazaar Areas like Hokse Bazaar, Panchkhal Bazaar area and Palanchowk Bhagwati Area, the sample of which has been attached in ***Annex D***.

4) Public Protests

Due to the interruption of traffic flow, there is high chance of protests by the local people. This may interrupt the construction activities of the proposed project.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Public Consultation should be carried out at various stages & locations as per requirement.
- Implement Grievance Redress Mechanism
- Pre-notify the public regarding the construction works that may hinder their daily activities and Coordinate with them properly

5) Disruption to Local Vendor's Business

The construction works during pipe laying activities may disrupt local vendor's business as the construction activities may obstruct their customers to have easy & direct access to their shops. This may hamper their daily business activities.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Avoid delay in construction works and Prompt Backfilling rifght after completion of pipe laying works.
- Provision of temporary access to the shops through provision of planks
- Pre-notify the vendors regarding the construction works that may hinder their daily activities and Coordinate with them properly

6) Mobilization of Child Labor

During construction period, there is possibility of mobilization of child labor by the contractors which is against the Child Labor Prohibition Act,2000 as child labor deprives

children off their childhood and their right to education,health, safety and moral development.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include:

- As the Child Labor Prohibition Act, 2000 states that "No Child having not attained the age of 14 years shall be engaged in works as a laborer" during mobilization, provision for the requirement of submission of the citizenship certificate of each labor,should be made.
- During contract agreement, the agreement by the contractor to follow Child Labor Prohibition Act, 2000 and Child Labour Prohibition Rules & Regulations,2006, should be made.

7) Impact on Sustainability of Works

Nepal is a seismic prone country. It is the geographical location of Nepal that makes it extremely susceptible to seismic activity from the nearby Indian and Tibetan plates. Historically, Nepal has been prone to significant disasters resulting in mass destruction and claiming thousands of lives. Most recently, on 25 April 2015, a 7.8 magnitude earthquake struck in Gorkha district that resulted in the loss of life of thousands of people. As per *Nepal Disaster Management Reference Handbook (2017).Center for Excellence in Disaster Management and Humanitarian Assistance,* this devastating earthquake affected over 50 districts in Nepal. Kavre, the project district could not remain untouched from this disaster. Nepal is still experiencing repeated but random tremors of various magnitude. Hence, we cannot ignore the fact that there is high possibility of occurrence of such seismic events in the future that will be experienced in the project town also. If this occurs during the construction period of the proposed project, this may unsustain the project by causing damage to the unsettled/unfinished/uncured and/or completed structures affecting their structural integrity.

The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

The mitigation measures for this impact include:

- After every seismic event, the contractor must conduct engineering investigation of built structures and implement the necessary corrective actions immediately as a mitigation measure for this impact.

- Prepare Emergency Preparedness and Response Plan

8) Damage to the existing utilities

During the construction phase, while excavating the earth, there is possibility of the existing water supply distribution pipelines getting damaged in a few places particularly in the market area. Similarly, the existing paved as well as unpaved road will also get damaged. This will obviously create discomfort to the people and people will be deprived of regular facilities they are getting from the existing utilities.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration

The mitigation measures for this impact include:

If during construction phase, the problem regarding damage to the exisitng facilities arises, then it will be the fault of the people involved in construction works as this problem will be considered during design phase. This problem will arise only if no carefulness is adopted by the workers and if the pipeline layout drawings prepared during design phase is not strictly followed. Hence, the mitigation measure for this impact is to monitor construction workers to adopt carefulness and to strictly follow the layout drawings.

Similarly, during excavation works, damage to the existing paved as well as unpaved roads can be mitigated through reinstatement works. The proposed project has provision for this reinstatement works and the cost estimate has been included in the the detailed design cost estimate of this proposed project.

9) Impact on Downstream Users

During construction works at Intake/Sump Well site, there is chance of contamination of the source water due to carelessness in the sanitation behaviour of workers. The consumption of contaminated water will affect the health of the downstream users.

Similarly, abstraction of water from the proposed source may lessen the quanity of water at the downstream due to which downstream users may be deprived of sufficient quantity of water they have been drawing regularly from the proposed source. However, regarding this project, there will be no issue of insufficiency of water for the downstream users. It is because Sunkoshi is snowfed Perennial River and has sufficient quantity of water. The detailed design has proposed to use seepage water from the infiltration gallery that is proposed to be constructed at the sump well site. This seepage water will

be drawn at the tapped discharge of 84 lps which in actual, is very negligible amount of water in comparison to the discharge of the Sunkoshi River

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact include:

- Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly.
- Provision of temporary latrines with basic facilities

c) Operation Phase

1) Occupational Health and Safety Hazards

Worker's exposure to, and/or mishandling of chemicals and other hazardous substances pose health and safety hazards.

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

(i) installation of clear, visible signage in premises onsafety measures; and (ii) setting up amechanism for the quick response to spills of chemical and hazardous substances.

2) Delivery of Unsafe Water

Unsafe water delivered due to any one or combinations of the following will have impact on public health: (i) accidental human error in chlorine dosing; (ii) accidental spill of hazardous substances; (iii) leaks in the system; (iv) lack of environmental quality monitoring; (v) inadequate maintenance and housekeeping; and (vi) deteriorating quality of groundwater resource without parallel upgrading the water treatment process.

The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

The mitigation measures for this impact include;

(i) ensuring the correct operation of water treatment plant to meet satisfactory water quality; (ii) providing safe storage for chemicals; (iii) ventilation of Housed dosing unit for chlorine and (iv) train operators for handling chlorine for which Chlorine Use Guidelines as included in ***Annex I*** will be followed.

3) Impacts on Consumer's Health

Irregularity in the supervision of the operation of distribution system may lead to excessive algae growth in service reservoir which may produce toxins causing serious illness in humans consuming water. The algal growth may also impart earthy taste & odor which may create dismay to the consumers and this may result in customer complaints that may lead to protests also.

The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

The mitigation measures for this impact are as follows:

- Regular Monitoring by the WUSC
- Removal of Algae grown within the reservoir at regular intervals by the operating team deployed by the WUSC.
- Monitoring & Proper Implementation of WSP.

4) Non-Sustainability of Services or Completed Works

The critical impacts induced by climate change droughts are changes in temperature, precipitation, and sea levels, all of which have varying consequences not only on ecosystem but on the availability of water supplies. Climate change will alter the hydrological characteristics of surface water due to changes in seasonal rainfall pattern and surface run-off. This will affect stream, river and reservoir yields and recharge of ground water aquifers making water resources difficult to manage and use. Good engineering design should accommodate the climate change issues.This issue will arise and result in disruption in smooth operation of water supply service with the Operator's disregard of these impacts. Along with this, the unsustainability of the completed works may result due to the issues that include; (i) Lack of Sense of ownership & Affordability; (ii) Lack of Institutional Capacity & Policy Compliance and (iii) Ineffectiveness in O & M.

The following mitigation measures to avoid non-sustainability of services or completed works are as follows:

- WUSC should monitor yield closely especially in the dry season and during a climate-change-induced drought.
- After every seismic event, WUSC should conduct engineering investigations of completed works and implement the necessary corrective actions without delay.

This shall involve preparation of Emergency Preparedness & Response Plan and Immediate Implementation of this plan after any seismic event.

- Strengthening Institutional Capacity and Policy Compliance through various project related capacity building programs
- Carrying out regular O & M with effectiveness through proper management of WUSC

The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

The summary of impact matrix of adverse issues of the proposed project is given in the table given below:

Table 29: Summary of Impact Matrix of Adverse Issues

Adverse Issues	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
A) Impacts on Physical Environment					
i) Design Phase					
Soil Erosion & Slope Instability	D	M (20)	L (20)	ST (5)	Insignificant (45)
ii) Construction Phase					
Soil Erosion & Land Surface Disturbances	D	M (20)	L (20)	ST (5)	Insignificant (45)
Spoil Disposal & Gully Erosion	D	M (20)	L (20)	ST (5)	Insignificant (45)
Air Pollution	ID	M (20)	R (60)	ST (5)	Very Significant (85)
Noise Pollution	D	H (60)	L (20)	ST (5)	Very Significant (85)
Generation of Solid Waste & Wastewater from the construction site & worker's camp	D	M (20)	L (20)	LT (20)	Significant (60)
Accidental Leakage or Spillage of Stored Fuel/Chemicals	D	M (20)	L (20)	LT (20)	Significant (60)
Impact on Land Use Pattern	D & ID	M (20)	L (20)	LT (20)	Significant (60)
Disruption to Natural Drainage	D	M (20)	L (20)	LT (20)	Significant (60)
Haphazard Disposal of Dismantled Debris	D	M (20)	L (20)	LT (20)	Significant (60)
B) Impacts on Biological Environment					
i) Construction Phase					
Impacts on Flora and	D	M (20)	L (20)	ST (5)	Insignificant

Adverse Issues	Impact Rating				
	Nature	**Magnitude**	**Extent**	**Duration**	**Rating**
Fauna					(45)
Impacts on Aquatic Life	D	M (20)	L (20)	ST (5)	Insignificant (45)
Forest Fire	D	M (20)	L (20)	ST (5)	Insignificant (45)
Forest Encroachment	ID	M (20)	L (20)	LT (20)	Significant (60)
ii) Operation Phase					
Impacts on Aquatic Life	D	M (20)	L (20)	LT (20)	Significant (60)
C) Impacts on Chemical Environment					
i) Construction Phase					
Impacts on Water Quality of the nearby rivers	D	M (20)	R (60)	ST (5)	Very Significant (85)
ii) Operation Phase					
Impacts on Quality of Water Stored in Reservoir	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impact on Water Bodies	D	M (20)	L (20)	LT (20)	Significant (60)
D) Impacts on Socio-economic Environment					
i) Design Phase					
Structural Instability	ID	M (20)	L (20)	LT (20)	Significant (60)
Health & Safety of Community & Workers	ID	M (20)	L (20)	LT (20)	Significant (60)
Damage to the existing facilities	D	M (20)	L (20)	ST (5)	Insignificant (45)
ii) Construction Phase					
Community Health and Safety Hazards	ID	M (20)	L (20)	ST (5)	Insignificant (45)
Workers' Health and Safety Hazards	ID	M (20)	L (20)	ST (5)	Insignificant (45)
Traffic Congestion	D	M (20)	L (20)	ST (5)	Insignificant (45)
Public Protests	D	M (20)	L (20)	ST (5)	Insignificant (45)
Disruption to local vendor's business	D	M (20)	L (20)	ST (5)	Insignificant (45)
Mobilization of Child Labor	ID	M (20)	L (20)	LT (20)	Significant (60)
Impacts on the sustainability of works	D	H (60)	L (20)	ST (5)	Very significant (85)
Damage to the existing facilities	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impact on Downstream	D	M (20)	L (20)	ST (5)	Insignificant

Adverse Issues	Impact Rating				
	Nature	**Magnitude**	**Extent**	**Duration**	**Rating**
Users					(45)
iii) Operation Phase					
Occupational Health & Safety Hazards	ID	M (20)	L (20)	LT (20)	Significant (60)
Delivery of Unsafe Water	D	M (20)	L (20)	LT (20)	Significant (60)
Impact on Consumer's Health	D	M (20)	L (20)	ST (5)	Insignificant (45)
Non-Sustainability of Services or Completed Works	ID	M (20)	L (20)	LT (20)	Significant (60)

Source: National EIA Guidelines, 1993 & IEE Study 2018/019

Note: Scoring is done based on following;

Nature of Impact: D = Direct; IN = Indirect;

Magnitude, H = High (60); M = Medium/Moderate (20); and L = Low (10)

Extent, R = Regional (60), L = Local (20); and S = Site-specific (10)

Duration, LT = Long-term (20), MT = Medium-term (10); and ST = Short-term (5)

The points/scoring are taken from the National EIA Guidelines, 1993

Significance of Impact

Total Score: More than 75 : Very Significant

50-75 : Significant

Less than 50 : Insignificant

The above given table shows that *Air Pollution*, *Noise Pollution, Impacts on Water Quality of nearby rivers and Impact on Sustainability of works* are evaluated as "Very Significant". However, if the mitigation measures as described above for these impacts are properly adopted, these impacts would not be problematic for the project implementation. Apart of this, the Table 29 also shows that some impacts are insignificant & some are significant. The best way to mitigate these impacts is to follow the proposed mitigation measures and to implement them effectively.

VII. INFORMATION DISCLOSURE, CONSULTATION & PARTICIPATION

A. Stakeholder Consultation & Participation

Stakeholder consultation and participation is an essential process in project preparation. It is also a part of information disclsoure. It will disseminate as well as collect information regarding the proposed project by involving various stakeholders that includes Key Informant Interviews, Stakeholders Meetings, Focus Group Discussions (FGD), On-site discussions with WUSC and Random Field Interviews. The minutes of various meetings undertaken during field visits are also included in ***Annex H***.

This stakeholder consultation requires the analysis of stakeholders through the identification of the potential participants and the methods of their involvement. The table given below illustrates the concerned stakeholders of the proposed project that will have either primary or secondary.

Table 30:Stakeholder Analysis & Mapping

S.N.	Stakeholders	Primary[3]	Secondary[4]	Stakeholders 'Role or Interest	Level of Influence
1.	Government of Nepal		✓	It is the executive and central body.	High
2.	Ministry of Water Supply (MoWS)		✓	It is the lead executive agency and is responsible for policy coordination, guidance, review of programs, ensuring that all aspects relevant to achieve the objective of the project and for sustaining the improved services to the required level.	High
3.	ADB		✓	It supports government of Nepal in improving and enhancing the existing water supply service.	Medium
4.	Department of Water Supply and Sewerage Management		✓	It is the lead-implementing agency and works under MoWS with the responsibility of planning, implementation, operation, repair & maintenance of the proposed project.	High
5.	DWASH-CC		✓	It provides coordination in the preparation of local WASH plans with inputs from WASH sector actors and in the effective implementation of the local plans related to this project.	High

[3] Primary Stakeholders: people, groups and institutions affected positively (beneficiaries) or negatively (involuntarily resettled) by the proposed program

[4] Secondary Stakeholders: people, groups and institutions that are important intermediaries in the program delivery process

S.N.	Stakeholders	Primary[3]	Secondary[4]	Stakeholders 'Role or Interest	Level of Influence
5.	UWSSP, PMO, RPMO & DRTAC		✓	It is responsible in successfully implementing the proposed project activities, establishing coordination with ADB & GoN and managing day to day activities at municipality levels.	High
6.	Town Development Fund (TDF)		✓	TDF will assist the project municipality conducting financial appraisal of the proposed project and advice DWSSM on its outcomes prior to the start of detailed design process.	High
7.	Local Bodies (DCC, Municipality & Ward Offices)		✓	It is responsible for establishing coordination with the implementing agency. Here, the municipality will be also responsible for policy compliance as well as for addressing public protests if any.	High
8.	Community Forest User's Group		✓	It is responsible for establishing coordination with the contractor during construction works within the community forest area.	High
9.	Forest Security Personnel		✓	It is responsible for establishing coordination with the contractor during construction works and for establishing harmony between locals and construction workers within the community forest area.	High
10.	DSMC		✓	It will assist PMO & RPMO in the overall planning, implementation and monitoring of the project activities regarding environmental & social safeguards requirements.	High
11.	WUSC		✓	It is responsible for O & M of the proposed project. It will also facilitate the concerned authorities during planning as well as construction phase.	High
12.	Households (Families & Individuals)	✓		They are the main beneficiaries and are benefitted by the provision of adequate, safe, reliable & potable drinking water.	Low
13.	Contractors, Petty Contractors		✓	It is responsible for bidding for works and involved in the construction of the proposed project.	Low

S.N.	Stakeholders	Primary[3]	Secondary[4]	Stakeholders 'Role or Interest	Level of Influence
14.	Local Technicians/Plumbers	✓		This group will be benefitted through the increased work opportunities related to construction works of the proposed project.	Low
15.	Unemployed Locals	✓		This group will be benefitted through the increased work opportunities related to construction works of the proposed project.	Low
16.	Local Vendors	✓		This group will be affected by the pipe laying works at core bazaar areas interfering the access to their shops.	Low
17.	Schools & Hospitals	✓		This group will be benefitted by the provision of enhanced and improved continuous water supply service.	Low
18.	Commercial Establishments (Private Enterprises)	✓		This group is benefitted by enhancing their business by supplying items to the construction employees regarding their basic needs.	Low
19.	Scrap Vendors	✓		This group will be benefitted by purchasing the recyclable wastes generated from the construction activities as well as from workers camp.	Low
20.	Local Leaders		✓	This group will facilitate to establish strong coordination between the local people and the project authority.	High

Source: IEE Field Study 2018 and DEDR & DDR,2019

The consultations were carried out on various dates at varous locations within the project town for the discussion of the anticipated environmental impacts that may result from the construction of the proposed project. The consultations were undertaken with key stakeholders that includes Local Bodies, Beneficiaries Households, TDF, PMO, RPMO & DRTAC in line with ADB's requirements pertaining to environment and social considerations. The key concerns of the people related to the project that includes Implementation of the safeguard policy framework in field level, Delivering the information regarding safeguard activities to local level, Willingness to pay, Upfront cash collection and People's participation in project implementation were discussed.

B. Major Issues Raised by the Stakeholders

The major issues raised by the key stakeholders during stakeholder consultation are as follows:

i. The project town is in need of safe, reliable and potable water.
ii. Water shortage problem is acute in the project town during dry season.
iii. People of the project town are relying on untreated water as the water through the existing water supply system is directly distributed in the town through small service reservoirs.
iv. The operating system of the existing water supply system is good but the supply system is intermittent and there is no proper design of distribution system.
v. The project should give priority to local people while hiring for the construction activities.
vi. The project must consider solid waste management issues during construction period.
vii. The proposed project must address the socioeconomic problems that may be observed during the construction period at Ilam Bazaar area like Traffic Congestion, Disruption to Local Vendors, Discomfort to the passerby,Noise Pollution, Air Pollution, Damage to the existing facilities etc.
viii. The construction works within the community forest areas should not involve cutting trees as well as destruction of any kind of forest resources.

The assurance made by the study team regarding the issues raised by the stakeholders are as follows:

i. The proposed project will address the water shortage problem faced by Panchkhal Municipality.
ii. The proposed project has provision of water treatment system. This will resolve the problems of consumption of untreated water.
iii. The proposed project has provision of continuous water supply system. This will end the irregular water supply service.
iv. The proposed project with water treatment facility and continuous water supply provision if effectively implemented will address the needs of Panchkhal municipality residents regarding safe, reliable and potable water supply service.
v. The socioeconomic problems raised by the stakeholders have been considered in IEE study and this IEE study has proposed mitigation measures for these issues. Accordingly, for ensuring the effective implementation of the proposed mitigation measures, EMP will be prepared and the contractor will be enforced to consider, follow and implement the EMP during construction.

vi. The solid waste management plan will be prepared,followed and implemented during the construction phase of the project that includes Spoil Management & Disposal, Disposal of Dismantled Debris and Management of Construction Wastes & Solid Wastes.

vii. Local workers of Panchkhal Municipality will be given priority for employment to the extent possible however; it requires strong coordination with the concerned contractor.

The project envisages that stakeholder consultations will continue during the project period and concerned stakeholders will be invited and encouraged to participate. The PMO and ICG will maintain rapport with WUSC and the municipality. PMO, ICG, Contractors, and WUSC will be open to the public to discuss concerning the progress of the subprojects, adverse impacts, mitigation measures and environmental monitoring and grievances. The stakeholder consultations in future will be as follows.

i. During construction, if change in design, alignment, and location, the PMO and ICG will hold at least one public consultation to solicit perceived impacts, issues, concerns and recommendations from affected communities;

ii. Before construction, the PMO and ICG will conduct an information, education and communication (IEC) campaign among the affected communities about the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the PMO and ICG, and status of compliance with the Government's environmental safeguard requirements. Billboards about the subproject, implementation schedule and contact details of the executing agency, PMO-ES, ICG-ESA and Contractors will be set up at strategic locations. The grievance redresses procedure and details will be posted at the offices of the ICG, WUSC and VDC;

iii. During construction, regular random interviews will be conducted by the ICG-ESA every month to monitor environmental concerns of subproject communities;

iv. During operation, periodic random interviews will be conducted by the ICG and WUSC to monitor the environmental concerns of subproject communities;

v. The public consultations and information disclosure will be continuous throughout the project cycle. PMO and ICG will be responsible for designing and implementing such aspects on the ground.

The GoN-approved IEE Report (in English), will be available at the offices of PMO, ICG, and WUSC for the perusal of interested parties. Copies may be made available upon formal request. IEE and environmental monitoring reports will be disclosed on the ADB's and STWSSSP website. This will be also as a part of Information Disclosure.

VIII. GRIEVANCE REDRESS MECHANISM

A. Purpose of the Grievance Redress Mechanism

A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate resolution of affected persons' concerns, complaints, and grievances related to social, environmental and other concerns on the project. The GRM will aim to provide a time-bound and transparent mechanism to resolve such concerns. The mechanism, developed in consultation with key stakeholders, will ensure that: (i) the basic rights and interests of every person adversely affected by the social and environmental performance of a Project are protected; and (ii) their concerns are effectively and timely addressed.

A common GRM will be in place for social, environmental or any other grievances related to the project. The GRM will provide an accessible forum for receiving and facilitating resolution of affected persons' grievances related to the project. Project will publish the sample grievance registration form on its website, and publish it in local language, at the hoarding board of each of the participating WUA or municipalities' office. Every grievance shall be registered with careful documentation of process adopted for each of the grievance handled, as explained below. The environmental and social safeguards officer (ESO/SSO) at the project management office (PMO) will have the overall responsibility for timely grievance redress on environmental and social safeguards issues. The Social Safeguards Officer at the Regional Project Management Office (RPMO) will be the focal person for facilitating the grievance redress at the local level.

A municipal-level public awareness campaign will be conducted on a regular basis as shown in the Communication & Public Participation Plan (CAPP) of the project to ensure awareness on the project and its GRM. The social and environmental safeguards experts of the PMQAC and RDSMCs will support the WUA or municipalities in conducting municipality-wide awareness campaigns, which will ensure that all stakeholders including poor and vulnerable are aware of the GRM and project's entitlements.

B. Proposed Set-Up

A Grievance Redress Committee (GRC) will be formed at the Municipality level, comprising the Mayor as Chairperson of GRC, and Regional Project Manager RPMO as Secretary. The GRC members will comprise of (1) WUSC Secretary; (2) RPMO

Engineer; (3) RPMO social /environmental (as relevant) officer, (4) representative of affected persons, (5) RDSMC's safeguards specialist (social/environment as relevant), (6) a representative of reputable and relevant CBO/SHG/organization working in the project area as invitee[5] , and (7) contractor's representative. The secretary of the GRC will be responsible for convening timely meetings and maintaining minutes of meetings. The concerned social safeguards expert of RDSMC will support the RPMO safeguard's officer and Project Manager of RPMO to ensure that grievances, including those of the poor and vulnerable are addressed. All GRCs shall have at least two women committee members. Along with representatives of the APs, civil society and eminent citizens can be invited as observers in GRC meetings.

The functions of the local GRC are as follows: (i) 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) record grievances of APs, categorize and prioritize them and provide solutions within 15 days of receipt of complaint by WUA or local bodies; and (iii) ensure feedback to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

The GRM procedure is outlined below in detail, with each step having time-bound schedules and responsible persons to address grievances and indicating appropriate persons whose advice is to be sought at each stage, as required:

(i) First Level of GRM (WUA level): The first-level, which is also the most accessible and immediate venue for quick resolution of grievances will be the contractors, RDSMC field engineers and RPMO supervision personnel, who will immediately inform the WUA. Any person with a grievance related to the project works can contact UWSSP to file a complaint. The municipal-level field office of the RPMO, in WUA's building, will document the complaint within 24 hours of receipt of complaint in the field, and WUA or local bodies will immediately address and resolve the issue at field-level with the contractor, supervision personnel of RPMO and RDSMC field engineers within 5 days of receipt of a complaint/grievance. The assigned RDSMC's Social Mobilizer will be responsible to fully document: (i) name of the person, (ii) date of complaint received, (iii) nature of complaint, (iv) location and (v) how the complaint was resolved. If the complaint remains unresolved at the local level within 5 days, the WUA will forward the complaint to the municipality level GRM.

[5] If the complaints are related with IP/Dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities shall be involved.

(ii) Second Level of GRM (Municipality level): The complainant will be notified by the WUA that the grievance is forwarded to the Municipality-level GRC. The M level GRC will be called for a meeting, called and chaired by the Mayor. The GRC will recommend corrective measures at the field level and assign clear responsibilities for implementing its decision within 10 days of receipt of complaint by WUA. If the grievance remains unresolved within 10 days of receipt of complaint by WUA, the matter will be referred to the third level. The RPMO Engineer will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings, providing feedback to complainants and taking follow up actions so that formal orders are issued and decisions are carried out.

(iii) Third Level of GRM (PMO Level): Any unresolved or major issues at Municipality level will be referred to the PMO for final solution. The PMO's Project Director (PD) will have special meeting to find solutions. Decision has to be made within 15 days of receipt of complaint by WUA. The PD will sign off on all grievances received by the PMO. The concerned Deputy Project Director (DPD) and environmental and social safeguards officers (ESO & SSO) of PMO will be involved with support from the PMQAC's social/environment safeguards experts. The SSO will be responsible to convey the final decision to the complainant.

The complainant will have to fill up Grievance Redress Form as shown in ***Annex C*** to file the complaint. All paperwork (details of grievances) needs to be completed by the WUA member secretary assisted by RDSMC and circulated to the WUA Chairperson and members. At Municipality level, the RPMO Engineer will be responsible for circulation of grievances to the Regional Project Manager, DWSS, Mayor and other GRC members, prior to the scheduled meetings. The RPMO's Engineer will be responsible for follow-through of all escalated grievances. All decisions taken by the GRC will be communicated to the APs by the RPMO's SSO.

Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

In the event that the established GRM is not in a position to resolve the issue, the affected person also can use ADB's Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB Nepal Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries (DMCs). The ADB's AM information

will be included in UWSSSP Information Datasheet (PID), to be published in web and distributed to the affected communities, as part of the project GRM.

This GRM procedure is briefly depicted in ***Figure 4*** given below:

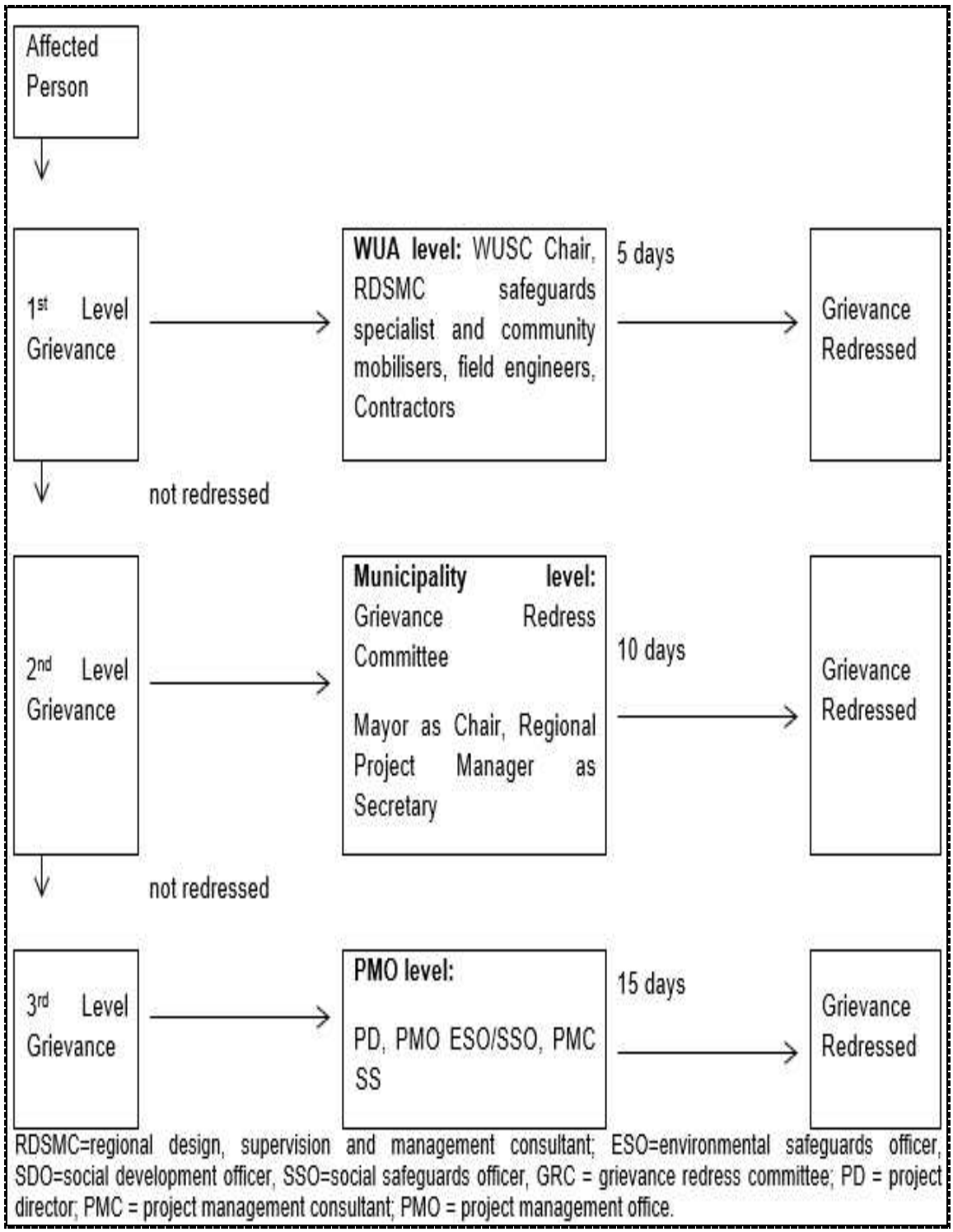

Figure 4: Grievance Redress Mechanism (Formal Approach)

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

The purpose of the environmental management plan (EMP): is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assignment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impacts of the project and in enhancing beneficial impacts; and (iv) ensuring that safety recommendations are complied with.

A copy of EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. EMP will be made binding on all contractors operating on the site 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.

B. Institutional Arrangement

i. Executing and Implementing Agencies

The Ministry of Water Supply (MoWS) will be the executing agency with the responsibility of project execution delegated to the Department of Water Supply and Sewerage Management (DWSSM). Water User's and Sanitation Committees of the proposed towns are the implementing agencies.

The key responsibilities of the executing and implementing agencies are as follows:

Prior to construction:

- MoWS will deputize a qualified staff to act as the Environmental Safeguard Officer of the Project management office (PMO).
- MoWS will establish the grievance redress mechanism, including setting up the Grievance Redress Committee.
- The Water Supply and Environmental Division of the MoWS will be responsible for reviewing and approval of the IEE Report.
- DWSSM will review the IEE Report prepared by the Design, Supervision and Management Consultant Team's Environmental Safeguard Expert (DSMC-ESE) before forwarding this to MoWS.

- DWSSM will prepare the ToRs for the Environmental Safeguard Specialist that will engage to support PMO and for the Environmental Safeguard Specialists of the two Design, Supervision and Management Consultants that will be appointed to prepare the projects.

ii. Safeguard Implementation Arrangement

Project Management Office (PMO):A project officer (Environment) will be engaged in PMO to ensure implementation of environmental safeguards. He/ she will be provided with necessary consultant support, and capacity development and training. The responsibilities of the Environment Officer are:

(i) review and confirm existing IEEs and EMPs are updated based on detailed designs, that new IEEs/EMPs prepared by DSMCs comply to exclusion criteria and project selection guidelines as stipulated in the EARF and government rules; and recommend for approval to PMO;

(ii) approve subproject environmental category;

(iii) ensure that EMPs are included in bidding documents and civil works contracts;

(iv) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by RPMOs and contractors;

(v) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;

(vi) facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant;

(vii) supervise and provide guidance to the RPMOs to properly carry out the environmental monitoring and assessments as per the EARF;

(viii) review, monitor and evaluate effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken;

(ix) consolidate monthly environmental monitoring reports from RPMOs and submit semi-annual monitoring reports to ADB;

(x) ensure timely disclosure of final IEEs/EMPs in project locations and in a form accessible to the public;

(xi) address any grievances brought about through the Grievance Redress Mechanism (GRM) in a timely manner as per the IEEs;

(xii) undertake regular review of safeguards-related loan covenants, and the compliance during program implementation; and

(xiii) organize periodic capacity building and training programs on safeguards for project stakeholders, PMO, RPMOs, and WUAs.

Regional Project Management Offices (Eastern and Western RPMOs): The environmental officer assigned by DWSSM to the RPMOs will receive support from (i) the PMO environmental officer, (ii) environmental specialist from PMQAC; and (iii) the environmental specialist and EMP monitors of the regional DSMCs to carry out the following:

(i) prepare new IEEs and EMPs in accordance with the EARF and government rules;

(ii) include EMPs in bidding documents and civil works contracts;

(iii) comply with all government rules and regulations;

(iv) take necessary action for obtaining rights of way;

(v) oversee implementation of EMPs including environmental monitoring by contractors;

(vi) take corrective actions when necessary to ensure no environmental impacts;

(vii) submit monthly environmental monitoring reports to PMO; and

(viii) address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

PMQAC: The Project Management and Quality AssuranceConsultants (PMQAC) will provide support to the PMO in the following areas:

(i) ensure that the quality of the designs and construction of all water supply and sanitation components implemented under the project are to the required standards; and

(ii) assist the PMO with the overall planning, implementation and monitoring of the project during all stages of implementation including adherence to all environmental and social safeguards' requirements.

Regional DSMCs: The RDSMCs will provide support to the RPMOs in the following areas:

(i) prepare quality feasibility studies, detailed engineering designs, safeguards documents and bid documents

(ii) provide effective construction supervision and contract management of all water supply and sanitation components implemented under the project in its region

(iii) assist the RPMOs with the overall planning, implementation and monitoring of each subproject during all stages of implementation including adherence to all environmental and social safeguards requirements

(iv) work closely with the Water User and Sanitation Committees (WUSCs), respective project municipalities and communities to ensure that the citizens are aware of project benefits and their responsibilities

(v) ensure that poor and vulnerable groups will benefit equally from the project.

Civil Works Contracts and Contractors: EMPs are to be included in bidding and contract documents and verified by PMO and RPMOS. The contractor will be required to designate an environment supervisor to ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract. The government will ensure that bidding and contract documents include specific provision requiring contractors to comply with all; (i) applicable labor laws and core labor standards on (a) prohibition of child labor as define in national legislation for construction and maintenance activities, (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project site.

Capacity Building: The PMQAC safeguards experts (environmental and social) will be responsible for training the (i) PMO's safeguards officers (environmental and social); (ii) RPMOs' engineers and social development officers. Training modules will need to cover safeguards awareness and management in accordance with both ADB and government requirements as specified below:

(i) Environmental Safeguards
   - (a) sensitization on ADB's policies and guidelines on environment;
   - (b) introduction to environment and environmental considerations in water supply and wastewater projects;
   - (c) review of IEEs and integration into the project detailed design;
   - (d) improved coordination within nodal departments; and
   - (e) monitoring and reporting system. The contractors will be required to conduct environmental awareness programs and orientation to the workers prior to deployment to work sites.

(ii) Social Safeguards
   - (a) sensitization on ADB's policies on Involuntary Resettlement and Indigenous People;

(b) introduction to social safeguards assessment and document requirements;
(c) Consultation and participations requirements;
(d) Project GRM and ADB's Accountability Mechanism (AM); and
(e) monitoring and reporting system.

Water Users and Sanitation Committees (WUSCs): WUSCs are the eventual operators of the completed projects. The key tasks and responsibilities of the WUSCs are, but not limited to:

Before construction

- Facilitate public consultation and participation, information dissemination and social preparation.
- Provide available data to DSMC-ESS during the conduct of IEE
- Assist in securing the tree-cutting permit and/or registration of water source.
- Participate in the capacity development program.

During construction

- Assist in the observance of the grievance redress mechanism.
- Actively participate in the monitoring of Contractor's compliance with IEE and its EMP and the conditions set out with Government's approval of the IEE Reports.
- Facilitate public consultations, as necessary.

During operation

- Implement EMP and the Water Safety Plan.
- If applicable, actively work with the engaged licensed and accredited laboratory in water quality monitoring.
- Prepare the environmental monitoring report as per IEE.
- Ensure observance of the grievance redress mechanism.

Licensed and accredited laboratory: It is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring in the first few years of operation and to train the WUSC on the same. The laboratory will ensure that while carrying out the water quality monitoring as prescribed in the National Drinking Water Quality Standard and its Directives, 'hands-on' training is provided to the WUSC.

C. Environmental Management Plan (EMP)

The table given below gives brief details on the Environmental Management plan (EMP) matrix that is to be implemented for the project implementation:

Table 31: Environmental Management Plan Matrix

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
A. Beneficial Impacts					
1.Impact on Socioeconomic Environment					
a) Construction Phase					
Income	Employment Generation	• Recommend contractor to employ local people by giving high priority to women and under privileged group as far as possible. • Ensure equity in provision of wages to both male as well as female labors.	DSMC, Contractor & WUSC	• Contractors' Workers Log Book • Number of local labors employed in project • Consultant Monitoring Report	During Project Construction
Personal Skills	Skill Enhancement	• Making a proper work plan and code of conduct during the construction period. • Provision of regular hands on training to the workers during the project construction period	DSMC, Contractor & WUSC	• Contractors Work Schedule • Hands on training Photographs • WUSC monitoring report	During Project Construction
Local trade & business opportunity	Enhanced Local trade & business opportunity	• Recommend contractor to give priority to the local products during procurement of construction of materials. • Priority also will be given to local services like grocery stores, tea shops, hotel & restaurants etc. during the entire construction period.	DSMC, Contractor & WUSC	• Contractors' Materials Log Book • WUSC monitoring report	During Project Construction
b) Operation Phase					
Health & Hygiene	Improved health & hygiene	Regular maintenance of the water supply components should be done so that the project operates smoothly and the benefits are intact	WUSC	• Number of Site Inspection Visits • Photographs of Inspection Visits	During O & M

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
				• WUSC monitoring report	
Economy	Increase Economic Opportunity	• Ensuring regular maintenance of the water supply components • Promoting urbanization through proper land development activities in the area	• WUSC • Local Authority	• Number of Site Inspection Visits • State of properly & legally planned land use	During O & M
Social Status	Social Empowerment	• Prioritize the vulnerable groups in WUSC along with female groups. • Involving underprivileged group of people especially women and poor people in various capacity building programs and project related community meetings	WUSC	• Number of members of WUSC • Photographs of capacity building programs • Minutes of meetings	O & M phase
B. Adverse Impacts					
1. Impacts on Physical Environment					
a) Design Phase					
Topography/Geology	Soil Erosion & Slope Instability	• Incorporate measures and sites for handling excessive spoil materials • Incorporate drainage plan in final design	PMO, RPMO, & DSMC	• Spoil Management Plan • Final Design Documents	Before award of contract, During Detailed Design Phase
c) Construction Phase					
Topography/Geology	Erosion & Land Surface Disturbance	• Protecting the foundation from damage during backfilling • Using the right backfill materials • Compacting the backfills • Final finishing the subgrade to ensure that water drains away from the foundation	Contractor	• Contractor's Work Log Book • Field Photographs	Weekly Basis During Construction Phase
Spoil Management	Inappropriate disposal of spoils from the construction activities may result in gullying and erosion of spoil tips especially when it is combined with unmanaged surface water runoff.	• Follow Spoil Management Plan as included in Annex E. • Use of excess Spoil or Soil for filling depressed areas or borrow pits wherever possible. • Appropriate disposal of Spoil at the designated places. • Spoils should not be disposed on natural drainage paths, canals and other infrastructures.	Contractor	• Spoil Management Plan • Photographs • Location of Spoil Disposal Site • Photographs	During Construction Phase

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		• Provision of toe walls and retaining walls to protect the erosion of disposed spoils. • Provision of proper drainage, vegetation and adequate protection against erosion at the Spoil Disposal Site.			
Air Quality	Air Pollution	• Strict Prohibition of open burning of solid waste	Contractor	Written Notice/Code of Conduct	During award of contract
				Visible Emission	Weekly Basis During Construction
				Number of complaints from sensitive receptors	
		• Watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary;	Contractor	Number of water Tank/s	Weekly Basis During Construction
				Capacity of Water Tank/s	
				Daily/Weekly Frequency/Timing of water spraying	
				Locations of water spraying	
		• if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces;	Contractor	Contractors' Materials Log Book of Materials to ensure the use of crushed gravel	Weekly Basis During Construction
				Photographs	
Air Quality	Air Pollution	• Use of Construction/ Transportation Vehicles complying with NVMES,2069	Contractor	Number and Types of vehicles in use	Weekly Basis During Construction
				Certified documents for each vehicle used	
		• Regular inspection & maintenance of construction/transportation vehicles	Consultant & Contractor	Contractor's/Consultant's log book of vehicle inspection & maintenance	Daily Basis/During Construction
		• Supply of clean cooking fuel to workers instead of allowing them to use firewood for cooking.	Contractor	Written Notice/Code of Conduct	Prior to construction
				Type of fuel supplied to camps	Weekly Basis during construction
				Quantity of fuel supplied to camps	Weekly Basis during construction
Acoustic Environment	Noise Pollution	• Restricting noisy activities to daytime and overtime work to avoid using noisy equipment;	Contractor	Written Notice	Prior to construction
		• Prohibit the use of pressure horn by transportation	Contractor	Written Notice/Code of	Daily Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		vehiles		Conduct Number of vehicles fitted with pressure horns Maximum Sound Level of Pressure Horn	
		• Regular inspection & maintenance of construction/transportation vehicles to ensure the use of Vehicles complying with NVMES,2069 B.S.	Contractor	Contractor's/Consultant's log book of vehicle inspection & maintenance	Daily Basis
		• Regular inspection & maintenance to ensure the use of equipments/machinery that comply with applicable emission standards of GoN i.e., National Noise Standard Guidelines, 2012	Contractor	Contractor's/Consultant's log book of equipment/machinery inspection & maintenance	Daily Basis
		• Regular inspection & maintenance to ensure the use of Diesel Generators complying with National Diesel Generator Emission Standard,2012	Contractor	Contractor's/Consultant's log book of equipment/machinery inspection & maintenance	Daily basis
Solid Waste	Haphazard Disposal of Wastes	**a) Construction Wastes**			
		• Adopt 3R (Reduce,Reuse & Recycle) concept	Contractor	Daily/Weekly quantity/volume of reusable/recyclable SW collected	Daily basis
		• Ensure storage areas are secure, safe & weatherproof.	Contractor	Locations of stockpiling sites	Daily basis
		• Management of reusable wastes	Contractor	Number of cases of on-site reuses	Daily basis
		• Sale of Recyclable wastes to scrap dealer	Contractor	• Daily/Weekly quantity/volume of such wastes sold to or given to scrap vendors • Frequency of sale to scrap vendors	Daily basis
		• Final Disposal of Bio degradable soild wastes	Contractor	• Number/size of burial pits for final disposal of bio-degradable solid waste • Location of burial sites • Frequency of burials	Daily basis
		• Avoid over ordering of construction materials to the extent possible. This will be challenging, as it requires strong coordination with the concerned contractors,	Contractor	• Contractor's log book of construction materials	Daily basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		as it cannot be made mandatory. However, it is not impossible too to coordinate with the contractors in this regard. • Use standard size & quantity of construction materials.			
		• Construct garland drains to reduce the runoff from the stockpiles.	Contractor	• Location of construction sites • Photographs	Daily basis
Solid Waste	Haphazard Disposal of Wastes	**b) Solid Wastes, Wastewater and Sewage from labour camp**			
		• Adopt Segregation of Solid Waste (3R Concept) based on being biodegradable or non-biodegradable. It is because decomposers cannot break down non-biodegradable wastes and their disposal poses a big problem.	Contractor	• Number of Colored Bins to segregate wastes into biodegradable & non-biodegradable wastes	Daily basis during construction
		• Manage biodegradable wastes that include food waste, paper waste, biodegradable plastic, etc. by any suitable processes that include Composting & Incineration. If these two processes are not possible then, the wastes shall be managed either by handing over these wastes to the municipality waste collectors who will finally dispose those wastes to the landfill sites of the project town or by disposing those wastes to the burial pits at suitable place.	Contractor	• Daily/Weekly quantity/Volume of Biodegradable solid waste collected • Site Photographs • Contractor' Work Log Book	Daily basis during construction
		• Non-biodegradable wastes like glass, plastics & metals shall be managed by reusing them for site use or selling them to scrap dealers instead of disposing them	Contractor	• Daily/Weekly quantity/volume of such wastes sold to or given to scrap vendors • Frequency of sale to scrap vendors/dealers	Daily basis during construction
		• Strict Prohibition on open incineration of solid wastes & use of plastic materials to minimize the quantity of plastic wastes	Contractor	• Written Notice	Prior to Construction & During Construction
		• Construction of the temporary latrines with temporary soak pits & septic tanks within the campsite for proper disposal of sewage	Contractor	• Field Photographs • Contractor's Monthly Progress Report	Daily basis
		• Provide temporary but proper drainage system for proper outlet of waste water generated from cooking practices adopted by the workers	Contractor	• Field Photographs • Contractor's Monthly Progress Report	Daily basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		• Employ local people from nearby villages to maximum extent possible. It will minimize the number of workers residing at worker's camp. Lesser the number of people, lesser will be the solid waste & effluent generated. However, it cannot be made mandatory because availability of local people with required skills will not be ensured at the time of construction.	Contractor	• Contractor's Workers Log Book	Prior to the construction
Handling of Fuels/Chemicals	Accidental Leakage or Spillage of Stored Fuel/Chemicals	• Provision of well managed storage site	Contractor	• Location of storage site	Weekly Basis during construction
		• Organize awareness programs for the workers responsible for handling fuel/chemicals	DSMC & Contractor	• Records of awareness programs in the form of minutes, photographs	Priorot the construction
		• Supervise workers to handle fuel/chemicals properly	DSMC & Supervisor of Contractor	• Records of any accidental spillage/leakage	Daily Basis During Construction
		• Use of spill kit materials to block flow and prevent discharge to nearby water bodies	Contractor	• Contractor's log book of materials procured for construction	Weekly Basis During Construction
		• Scatter the Sawdust, sand or dry soil over the area of spill and leave for few minutes to soak up the fuel/chemical. So, availability of saw dust, sand or dry soil should be ensured in the store	Contractor	• Frequency of use of saw dust, sand or dry soil	Weekly Basis During Construction
		• Regular Inspection Visit to the storage site to inspect the leakage of the stored container of fuel/chemical	DSMC & Contractor	• Number of Site Visits • Complaints of Leakage	Weekly Basis During Construction
Land Use Pattern	Change in land use pattern in haphazard manner	• Selection of barren and public land only for the construction of project components • Avoid the acquisition of private and agricultural land for the construction of project components. • Monitoring on the haphazard land use & planning by the concerned authority.	PMO & DSMC	• Details of land ownership • Monitoring Reports on Haphazard Land Use	During Detailed Design Phase

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Drainage	Disruption to Natural Drainage	• Avoid the natural drainage pathways for pipe laying works.	DSMC & Contractor	Pipe Layout plan	During Construction
		• Stockpile the excavated materials at safe but nearby place.	DSMC & Contractor	Location of Spoil Disposal Sites	Daily Basis During Construction
		• Restore natural drainage system if the drainage system during construction is blocked.	Contractor	Photographs of before and after restoration	Daily Basis During Construction
Dismantled Debris	Haphazard Disposal of Dismantled Debris	• Immediate Response on handling of dismantled debris	Contractor	Number of complaints from the sensitive receptors	Daily Basis After Construction and Prior to Operation
		• Segregation of Dismantled Debris • Adopt 3R (Reduce, Reuse& Recycle) concept	Contractor	• Number of Colored Bins • Contractor's Work Log Book	Daily Basis
		• Sale of Recyclable Wastes to Scrap Vendors/Dealers	Contractor	• Quantity/Volume of such wastes sold to or given away to scrap vendors • Frequency of sale to scrap vendors	Daily Basis
2. Impacts on Biological Environment					
a) Construction Phase					
Flora & Fauna	Loss of vegetation, Loss of habitat of faunas	• Replace the excavated top soil to its original position after the completion of pipe laying work	Contractor	• Photographs of before and after the replacement of top soil • Contractor's Work Log Book	Daily Basis During Construction
		• Re-vegetating disturbed slopes and grounds, as applicable;	Contractor	• Photographs of revegetation of disturbed slopes and grounds • Contractor's Work Log Book	Weekly Basis During Construction
Flora & Fauna	Loss of vegetation, Loss of habitat of faunas	• Awareness programs regarding policy related to the conservation of existing flora & fauna, to the workers prior to the construction and the community during various meetings and discussion programs	PMO, DSMC & Contractor	Minutes & Photographs of Awareness Programs	Prior to Construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		• Adopt the suitable mitigation measures proposed to minimize noise pollution as mentioned earlier	Contractor	• Written Notice • Contractor's Work Schedule	As mentioned earlier
		• Regular Monitoring	DSMC & RPMO	• Contractor's Log Book • Number of Monitoring Visits	Daily Basis During Construction
Aquatic Life	Loss of habitat of aquatic life	• Strict Monitoring on the daily activities of workers and Prohibition on disposal of wastes to the water bodies during construction works at source area.	Contractor & DSMC	• Location of Labor Camp Site • Photographs • Number of Complaints from the sensitive receptors • Number of Monitoring Visits • Monitoring Reports • Written Notice to prohibit disposal of wastes	Weekly Basis
		• Provision of temporary but well-equipped toilets	Contractor & DSMC	• Location of these temporary facilities • Photographs of toilets constructed	Weekly Basis
		• Restriction to workers from fishing	Contractor & DSMC	• Written Notice • Number of complaints from the sensitive receptor	Daily Basis During Construction
		• Adopt measures mentioned above for the solid waste management	Contractor & DSMC	• Number of Colored Bins to segregate wastes Daily/Weekly • Quantity/Volume of Biodegradable solid waste collected	Daily Basis During Construction
Forest Fire	Impact on Flora & Fauna, Destruction of nutrients by the ashes, soil erosion	• Prohibition on burning dry grass or debris • Prohibition on camp fires & smoking within the forest area to the workers • Keeping firefighting equipment stand by within the construction sites; • Provision of safety trainings regarding forest fire to the construction workers prior to construction	Contractor & DSMC	• Written Notice right before the construction • Contractor's Log Book • Photographs of Safety Trainings	Daily Basis During Construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Forest Encroachment	Impact on Flora & Fauna	• Strict & Regular Monitoring during the entry of workers for the construction workers, • Mobilization of the concerned community forest groups, • Legal Provision along with imposing fines as punishment for those responsible for forest encroachment & • Provision of trainings to the construction workers to provide support in controlling encroachment	Contractor & DSMC	• Written Notice right before the construction • Contractor's Workers and Visitor's Log Book • Training Photographs	Daily Basis During Construction
b) Operation Phase					
Aquatic Life	Pollution of water bodies endangering aquatic lives	• Direct discharge of the raw sludge to the water bodies will be discouraged through strict monitoring to the operators involved.	WUSC	Number of complaints from the sensitive receptors	Weekly Basis
		• Proper Implementation of Water Safety Plan (WSP)	WUSC, DSMC & PMO	• WUSC Monitoring Reports • Water Safety Plan	Monthly Basis
3. Impacts on Chemical Environment					
a) Construction Stage					
Water Quality	Pollution on surface water sources by crossing of pipelines over water bodies, poorly managed construction sediments and other wastes, poor sanitation practices by workers	• Provision of Septage Disposal through construction of toilets with septic tanks	Contractor, DSMC	• Semi Annual Environmental Monitoring Report • Photographs of toilets constructed	Prior to Construction as well as During Construction
		• Disposing of spoils or excess soils as free filling materials as soon as possible	Contractor	• Spoil Management Plan • Location of Spoil Disposal Site	During Construction
		• Locating temporary storage areas on flat grounds and away from main surface drainage routes; • Shielding temporary storage areas with sandbags	Contractor	• Photographs of temporary storage areas	Monthly Basis
		• Adopt measures mentioned above for the solid waste management	Contractor	• Number of Colored Bins to segregate wastes • Daily/Weekly quantity/Volume of	Daily Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
				Biodegradable solid waste collected	
		• Provision of adequate water supply and sanitation facilities at work sites	Contractor	• Number of Complaints received from the workers • Number of Water Supplies to the workers	Weekly Basis
		• Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly.		• Number of supervisions • Reports on Supervision	Weekly Basis
b) Operation Stage					
Water Quality	Degradation of Quality of water stored within the reservoir	• Proper Implementation of Water Safety Plan (WSP)	WUSC O & M Team	Water Safety Plan of WUSC	Monthly Basis
		• Removal of Algae grown within the reservoir at regular intervals by the O & M team deployed by the WUSC	WUSC O & M Team	• Photographs • WUSC Monthly Reports	Monthly Basis
Water Quality	Impact on Water Bodies	• Disposal of raw sludge to the appropriate landfill or burial sites of the proposed project town	WUSC O & M Team	• Frequency of Burials • Location of Burial Sites	During Cleaning of sedimentation tank
		• Use of raw sludge as compost for agricultural land	WUSC O & M Team	• Quantity/Volume of Raw Sludge Scraped from sedimentation tank	During Cleaning of sedimentation tank
		• Avoid direct discharge of the raw sludge to the water bodies through strict monitoring to the operators involved	WUSC O & M Team	• Written Notice	During Cleaning of sedimentation tank
		• Proper Implementation of Water Safety Plan (WSP)	WUSC O & M Team	WUSC Monitoring Reports	During entire operation phase, Monthly Basis
4.Impact on Socio-economic Environment					
a) Design Phase					
Structural Instability	Cracking of structure leads to facility failure and public discomfort due to construction of water supply	• Proper Design of each & every component as per standard and code of practice.	PMO, RPMO & DSMC	Detailed Design Documents	During detailed design phase

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	components in high earthquake zones				
Health & Safety of Community & Workers	Lack of provision will have impact during construction	• Training on Community Health & Safety Hazards by DSMC by disseminating information in regard to this through training manuals, photographs & documents related to safety.	PMO, RPMO & DSMC	Photographs & Minutes	During detailed design phase and Prior to Construction
Existing facilities	Disruption of services & False Claims by the People	• Coordinate with the concerned agencies to finalize the pipe network layout to avoid damage to the existing utilities. • Design & Locate pipelines away from existing utilities during design as far as possible. • Provide budget for restoration/replacement of damaged utilities. • Photographs of construction sites before and after the construction to avoid the false claims. • Prompt Reinstatement of paved as well as unpaved roads after completion of excavation works for pipe laying	DSMC, RPMO, PMO, Contractor	• List of affected utilities and operators; • Pipeline Layout Plan • Bid document • Photographs before and after the construction sites • Contractor's Work Log Book	During detailed design phase
b) Construction Phase					
Community Health & Safety	• Cross-cutting threats from construction's impacts on air and water quality, ambient noise level; mobility of people/goods/services; accesses to properties/economic activities/social services; service disruptions, etc. • Communicable and transmittable diseases may potentially be brought into the community by	• Contractor's implementation of EMP	Contractor, RPMO, DSMC	EMP	During Construction Phase, Weekly Basis
		• Adequate lighting, temporary fence, reflecting barriers and signage at active work sites;	Contractor	• Photographs depicting lighting, temporary fencing, reflecting barriers and signage facilities. • Quantity of lighting, temporary fence, reflecting barriers and signage	During Construction Phase, Monthly Basis
		• Contractor's preparedness in emergency response;	Contractor	Emergency Response Plan	During Construction, Weekly Basis
		• Adequate dissemination of GRM and Contractor's observance/implementation of GRM	Contractor	• Monthly Reports of GRC • Number of Grievance Redress Form received	During Construction, Monthly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	construction workers				
Workers Health &Safety	Risk to worker's health & safety	• Comply Labor Act (1992) of GoN • Train all site personnel regarding environmental health and safety as like in design phase by DSMC & Contractors • Provide **Personal Protective Equipment (PPEs)**to workersthat includes protective clothing, helmets, goggles and other equipments designed to protect the wearer's body from injury or infection and ensure their effective usage • Require workers to wear high visibility clothes	Contractor	• Site –Specific H&S plan • Record of H&S orientation training like Photographs &Minutes • Availability of personal protective equipment at construction site • Environmental Site Inspection Report	Visual inspection by RPMO (monthly) and DSMC-ESS on a weekly basis. Frequency and sampling sites to be finalized during detailed design and final location of project components
		• Exclude public from worksites	Contractor	Contractor's Visitors' Log Book	Weekly Basis during construction
		• Maintain accident reports and records.	Contractor	Number of accidents as per site records	Weekly Basis during construction
		• Make first aid kits readily available	Contractor	Contractor's Health & Safety Log Book	Weekly Basis during construction
Workers Health &Safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards, which can arise from working at height and excavation works.	• Maintain hygienic accommodation in work camps • Ensure uncontaminated water for drinking, cooking, and washing, • Assure clean eating areas • Make sure sanitation facilities are readily available • Provide adequate space and light to the camp site	Contractor	• Location of Worker's Camp Site • Number of Monitoring Visits • Number of Complaints from the workers	Monthly Basis during construction
		• Adequate supply of potable water to the camps and good sanitation within camps	Contractor	• Number of water supplies • Number of complaints from the workers	Weekly Basis during construction
		• Provide medical insurance coverage for workers	Contractor	Medical Insurance Documents	Prior to the construction
		• Provide orientation for guest visitors • Ensure that visitors do not enter hazard areas unescorted;	Contractor	• Record of Orientation training (Photographs & Minutes) • Contractor's Visitor's Log Book	Monthly Basis during construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		• Ensure moving equipment is outfitted with audible backup alarms; • Hearing protection equipment enforced in noisy environment	Contractor	Contractor's Log Book of Machinery & Equipment	Weekly Basis during construction
		• Chemical and Material storage areas need to be marked clearly	Contractor	Signage Board to make aware regarding Chemical Storage and Material Storage Area	Monthly Basis during construction
Traffic Congestion	Interference in the daily activities of people	• The trench for pipeline should not be abandoned and the contractor should be recommended to backfill the trench immediately. • The contractor will be accountable to provide signage at appropriate locations indicating available alternate access routes to minimize traffic disruptions. • The contractor will have to ensure access to shops and residences using simple wooden walkways. • Provision of alternative way for vehicular movement and pedestrians if possible • The contractor shall follow the Traffic Management Plan especially at Bazaar Areas like Hokse Bazaar, Panchkhal Bazaar area and Palnchowk Bhagwati Area	Contractor	• Number of Site Visit and Photographs of Sites • Traffic Management Plan	Daily Basis
Public Protests	Interruption in the construction activities	• Public Consultation should be carried out at various stages & locations as per requirement. • Implement Grievance Redress Mechanism • Pre-notify the public regarding the construction works that may hinder their daily activities and Coordinate with them properly	Contractor & DSMC	• Photographs • Minutes of Consultation Programs • Grievance Redress Mechanism Status • Written Notice or Miking	Prior to the construction
Local Vendor's Business	Discomfort to the customers to get access to the shops hampering the daily business activities	• Avoid delay in construction works and Prompt Backfilling rifght after completion of pipe laying works.	Contractor	• Field Visits • Contractor's Work Schedule	Weekly Basis
		• Provision of temporary access to the shops through provision of planks	Contractor	Photographs	Weekly Basis
		• Pre-notify the vendors regarding the construction works that may hinder their daily activities and	Contractor	Written Notice or Miking (Verbal Notice)	Prior to the construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Coordinate with them properly			
Deployment of Child Labor	Deprivation of Children's right to education, health, safety and moral development is deprived	• As the Child Labor Prohibition Act, 2000 states that "No Child having not attained the age of 14 years shall be engaged in works as a laborer" during mobilization, provision for the requirement of submission of the citizenship certificate of each labor,should be made.	Contractor & PMO	Citizenship Certificate of the workers	Prior to Construction
		• During contract agreement, the agreement by the contractor to follow Child Labor Prohibition Act, 2000 and Child Labour Prohibition Rules & Regulations,2006, should be made.	Contractor & PMO	Contract Document	During award of contract
Sustainability of Works	Damage to unsettled/unfinished/uncured and/or completed structures and affecting their structural integrity by seismic event if any	• After every seismic event, the contractor must conduct engineering investigation of built structures and implement the necessary corrective actions immediately • Prepare Emergency Preparedness and Response Plan	Contractor	• Monthly Progress Report • Contractor's Log Book	Construction Phase
Existing Facilities	Damage to the existing utilities creating discomfort to the people	• Monitor construction workers to adopt carefulness and to strictly follow the layout drawings. • Reinstatement Works	Contractor, RPMO, DSMC	• Number of Complaints received at GRC • Pipeline Layout Plan • Contractor's Bill of Quantities • Photographs	During Construction Phase on Daily Basis
Health of Downstream Users	Health Hazards due to intake of contaminated water	• Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly. • Provision of temporary latrines with basic facilities	Contractor	• Photographs • Number of Complaints received from the downstream user's group	During Construction Phase on Daily Basis
c) Operation Phase					
Occupational Health & Safety	Worker's exposure to, and/or mishandling of chemicals and other hazardoussubstances	• Installation of clear, visible signage in premises on safety measures	WUSC	• Number of Site Visits • Site Visit Reports • Photographs of location where signage are installed	Weekly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	pose health and safety hazards.	• Setting up a mechanism for the quick response to spills of chemical and hazardous substances.	WUSC	• Frequency of use of chemical & hazardous substances • Quantity of chemical/hazardous substances used for the proposed project	Monthly Basis
Drinking water supply	• Extraction of unsatisfactory raw water quality • Delivery of unsafe water to the distribution system • Inadequate protection of intake • Health Hazards arising from inadequate design of facilities for receiving, storing and handling of Cl & other chemicals	• Ensure the correct operation of water treatment plant to meet satisfactory water quality	PMO & RPMO	WUSC Monitoring Reports	Monthly Basis during operation
		• Provide Safe Storage for chemicals	Contractor	Location of Chemical Storage	Monthly Basis during operation
		• Ventilation of "Housed" dosing unit for chlorine	Contractor, PMO & DSMC	• Detailed Design Drawings • Contractor' Working drawings & Photographs of Dosing Unit Constructed	During Construction
		• Train operators for handling chlorine	RPMO, PMO & WUSC	Minutes & Photographs of Training	Prior to operation right after completion of construction
Consumer's Health	Irregularity in the supervision of the operation of distribution system may lead to excessive algae growth in service reservoir which may produce toxins causing serious illness in humans consuming water.	• Regular Monitoring by the WUSC	WUSC	WUSC Monitoring Reports	Monthly Basis
		• Removal of Algae grown within the reservoir at regular intervals by the operating team deployed by the WUSC.	WUSC	Frequency of Algae Removal	Monthly Basis
		• Monitoring & Proper Implementation of WSP.	WUSC	WUSC Monitoring Reports	Monthly Basis
Non-Sustainability of Services or Completed Works	Disruption in water supply service by sudden seismic	• WUSC should monitor yield closely especially in the dry season and during a climate-change-induced drought.	WUSC & the local body	• Number of Human Resources Mobilized for monitoring • Yield Monitoring Reports	During Dry Season and Immediate action during climate-change-induced drought.

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	events or climate change droughts	• After every seismic event, WUSC should conduct engineering investigations of completed works and implement the necessary corrective actions without delay. This shall involve preparation of Emergency Preparedness & Response Plan and Immediate Implementation of this plan after any seismic event.	• WUSC	WUSC Monitoring Reports	• Immediate after any seismic event
		• Strengthening Institutional Capacity and Policy Compliance through various project related capacity building programs	WUSC	• Photographs of capacity building programs • Minutes of such programs • WUSC Monitoring Report	During project cosntruction and During initial stage of operation phase
		• Carrying out regular O & M with effectiveness through proper management of WUSC.	WUSC	WUSC Monitoring Report	Right after the completion of project construction period

Source: IEE Field Study 2018

D. Environmental Monitoring Program

Environmental monitoring will be done during construction on three levels:

(i) Monitoring the development of project performance indicators by the PMO-ESS;

(ii) Monitoring implementation of mitigation measures by the Contractor; and

(iii) Overall regulatory monitoring of environmental issues by the PMO.

In addition to regular monitoring on-site (at the subproject level) by the ICG and DSMC-ESS on the EMP implementation of the mitigation measures, monitoring of key environmental parameters is proposed. ***Table 32*** presents the indicative environmental monitoring program for the subproject, which includes environmental parameters, with a description of the sampling stations, the frequency of monitoring, applicable standards, and responsible agencies. This will be updated during detailed design to ensure EMP and monitoring program is commensurate to the impacts of the subproject.

Table 32: Environmental Monitoring Program

	Field	Stage	Parameters	• Location	Frequency	Standards	Responsibility
1.	Air quality	• Before construction to establish baseline • Construction phase	PM10 SO2 NOx	• Worksite locations • Along water transmission main 1-km interval from PTWs • Construction campsite locations	• 24-hour monitoring once in a season (except monsoons) for the construction period	• National Ambient Air Quality Standards, 2003	Contractor
2.	Noise and vibration levels	• Prior to construction to establish baseline • Construction phase	Equivalent day and night time noise levels	• PTWs location • Along water transmission main 1-km interval from PTWs • Construction campsite locations	• Once in a season (except monsoons) for the construction period	• National Noise Standard Guidelines, 2012	Contractor
3.	Water quality	• Prior to construction to establish baseline • Construction phase	TDS, TSS, pH, hardness, BOD, fecal coliform, total nitrogen, total phosphorus, heavy metals, temperature, DO, hydrocarbons,	• Adjacent to construction sites (to be identified by the (DRTAC or DSMC))	• Twice a year (pre-monsoon and post-monsoon) for the entire period of constructi	• National Drinking Water Quality Standards, 2006	Contractor

	Field	Stage	Parameters	• Location	Frequency	Standards	Responsibility
			mineral oils, phenols, cyanide, temperature		on		
4.	Survival rate of landscaping, tree plantation	• O&M phase	Survival rate	• In the areas where re-plantation/ landscaping proposed	• Twice a year for 2 years	• None	WUSC

Source: IEE Study 2018/019

E. Institutional Capacity Development Program

Considering the limited capability of the Project's key players in environmental management, technical assistance from environmental specialists and capacity development during loan implementation will be needed. Capacity development will consist of hands-on training in implementing the responsibilities in EMP (as well as in EARF) implementation, complemented with a short-term series of lectures/seminars on relevant topics.

WUSC cannot monitor the quality of supplied water as prescribed in NDWQS and its Directives. Although monitoring kits and laboratory rooms will be provided, this would not guarantee WUSC can handle monitoring appropriately. DWSSM has five regional laboratories; however, some are not functioning fully due to lack of human resources. Considering that public health is a critical concern associated with water supply, it is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring for at least the first 2-3 years of operation with WUSC actively participating in developing its capacity. Water quality monitoring should be carried out in such a way that WUSC will be "learning by doing." After the engagement period, there should be continuing periodic training of new persons to ensure that the capacity of WUSC is sustained. The cost for monitoring during operation is based on the assumption that a licensed laboratory will be engagedin both the monitoring requirements and to train WUSCs. A Water Safety Plan is included in the project design and will oblige the operator to carry out water quality monitoring accordingly. The amount of NPR 500,000 will be provided annually to

implement the Plan. There will be sufficient fund to include training by the licensed and accredited laboratory while monitoring water quality.

The contractors will be required to conduct environmental awareness programs and orientation to the workers before deployment to the work site. The proposed training project along with the frequency of sessions is presented in ***Table 33.*** The Environmental Safeguard specialist & EMP Field Monitoring Staff are responsible for organizing different training programs for Environmental Management.

Table 33: Training Program for Environmental Management

Items	Pre-construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staff	Experiences and best practices sharing
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and GON and how the project will meet these requirements	To build the capacity of the staff for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and GON	To share the experiences and best practices aimed at learning lessons and improving implementation of EMP
Contents	Module 1: Orientation ADB Safeguards Policy Statement Government of Nepal Environmental Laws and Regulations Module 2: Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements Review of environmental assessment report to comply with ADB requirements Incorporation of EMP into the project design and contracts	Roles and responsibilities of officials/contractors/consultants towards protection of the environment Environmental issues during construction Implementation of EMP Monitoring of EMP implementation Reporting requirements	Experiences on EMP implementation – issues and challenges Best practices followed
Duration	1 day	1 day	1 day on a regular period to be determined by PMO, ICGs, and (provide if PMC/DRTAC or DSMC)
Participants	Executing and implementing agencies, PMO, and PMO staff (technical and environmental) involved in the project implementation	PMO ICGs Contractors	PMO ICGs Contractors

Source: IEE Study 2018

F. Staffing Requirement and Budget

Staffing requirement will include the: (i) deputizing a DWSSM or PMO staff as the PMO environmental safeguards officer; (ii) deputizing WSSDO staff as RPMOS environmental engineers in each subproject town; (iii) engagement of a PMO-environmental safeguards specialist to provide technical assistance and guidance to the PMO and partly to the RPMOS and capacity development/training; and (iv) a DSC environmental safeguards specialist to conduct the IEEs and prepare the IEE reports according to the provisions of this EARF.

The costs required for implementing the EMP will cover the following activities:

(i) Updating IEE, preparing and submitting reports and public consultation and disclosure;

(ii) Application for environmental clearances; and

(iii) Implementation of EMP, environmental monitoring program, and long-term surveys.

Environmental monitoring during construction will also be straightforward and will involve periodic site observations and interviews with workers and others, plus checks of reports and other documents. This will be conducted by PMO-ESS assisted by the PMO environmental safeguard officer. Therefore, no separate budget is required for the PMO-ESS.

The cost of mitigation measures and surveys during construction will be incorporated into the contractor's costs, which will be binding on him for implementation. The contractors will conduct the surveys.

The operation phase for mitigation measures are good operating practices to mitigate the environmental impacts of this phase &the responsibility remains to WUSC. WUSC will conduct all monitoring during the operation and maintenance phase. To ensure the delivery of safe drinking water from its catchment to the consumers, there is provision of Water Safety Plan (WSP)for the proposed project. If a licensed laboratory is engaged for the first 2-3 years of operation for training purposes, the cost can be accommodated under the Water Safety Plan. The cost of awareness program & WSP during the contract period is NPR 500,000.00 under provisional sum.

The indicative costs of EMP implementation is shown in ***Table 34*** given below:

Table 34: Indicative Cost of EMP Implementation

S. No.	Local Level Monitoring & Mitigation Measures	Mitigation Cost
1	Protection Works for Soil Erosion & Land surface Disturbances that includes Prompt Backfilling, Construction of Gabion Wall, RRM, Drainage Structures	No additional cost required
2	Capacity Building Programs	No additional cost required
3	Implementation of Water Safety Plan	No additional cost required
4	Chlorination	No additional cost required; it will be managed by WUSC itself
5	Removal of Algae grown within the reservoir & Disposal of Raw Sludge of Sedimentation Tank	No additional cost required; it will be managed by WUSC itself
6	Solid Waste Management	250,000.00
7	Revegetating disturbed slopes & grounds	150,000.00
8	Provision of temporary but well-equipped toilets	350,000.00
9	Provision of Spoil Disposal Site	200,000.00
10	Provision of Camp Site	400,000.00
11	Provision of Stockpiling Site	250,000.00
12	Provision of Hands on training to workers	100,000.00
13	Temporary Fencing, Use of Reflecting Barrier, Signage, Adequate Lighting	300,000.00
14	Provision of PPE to workers	350,000.00
15	Provision of Planks to provide access to shops & homes	50,000
16	Local Level Monitoring Measures	
a)	Air quality Monitoring	200,000.00
b)	Noise levels Monitoring	50,000.00
c)	Water Quality Monitoring	50,000.00
17	Emergency Response Preparedness	300,000.00
	Total Cost of Local Level Monitoring & Mitigation Measures	**3,000,000.00**

Source: IEE Study 2018/019

Note: The breakdown cost is based on past similar project experience however, independent cost may alter without altering the total cost.

The above given table shows that the total indicative cost for EMP implementation in NRs. 3,000,000.00. This has been included under provisional sum in BoQ and this total cost includes local level monitoring cost and mitigation costs that also includes necessary environmental mitigation measures for the anticipated impacts during the entire construction period.

G. Implementation Schedule

Environmental management is implemented from the detailed design phase through to procurement that will continue to construction, and operation phases. ***Table 35*** presents the tentative timeframe of key EMP activities about the subproject implementation schedule. Similarly, ***Table 36*** presents training for capacity building programs for the project.

As this IEE is based on the master plan, the given details in the following table are just envisaged and it will be finalized during detailed design phase.

Table 35: Environmental Management Implementation Schedule

Activity			Indicative Time Frame
PROJECT IMPLEMENTATION			
	Detailed Design & Bidding Documents		Q2 Y0
	Procurement		Q3 Y0
	Construction		Q4 Y0 – Q4 Y2
	Contractor Operating Period		Q3 Y2 – Q4 Y3
	Handover to WUSC for Operation		Q3 Y3 – Q1 Y4
	Defects Liability Period		Q3 Y2 – Q4 Y4
ENVIRONMENTAL MANAGEMENT			
	Overall		
	1.	Design Review and Technical Audit Consultant (DRTAC)-Engagement of Environmental Specialist	Starting Q4 Y0 (5 yrs of intermittent inputs)
	2.	PMO's submission of Environmental Monitoring Report (EMR)	
		- Monthly EMR for project's Monthly Progress Report	- 8th day after effective month
		- Semi-Annual EMR during construction for submission to ADB	- 8th day after effective 6-mo. period
		- Annual EMR for submission to ADB	- 8th day after aneffective year
	Before Construction Mobilization		
	1.	Finalization of EMP, (if applicable) revision of IEE	Q2 Y0
	2.	ADB review & approval of revised IEE & EMP.	Q 2 Y0
	3.	Obtaining Government's approval of IEE Report	Q2 Y0 – Q3 Y0
	4.	Community preparation (including disclosure of Final IEE & its EMP)	Q4 Y0
	5.	Establishment of baseline data (as set out in the EMP)	Q4 Y0 (shall have been done before award of contract)
	6.	Preparation of C-EMP by selected Contractor, review of C-EMP	Q4 Y0, before Notice to Proceed is
		Against SPS-compliant EMP.	given

Activity			Indicative Time Frame
	Construction Period		
		Mobilization to Demobilization	
	1.	Implementation of mitigation measures and conduct of environmental effects monitoring following the C-EMP.	Q4 Y0 – Q4 Y2
	2.	Submission of Environmental Monitoring Report (EMR)	Q4 Y0 – Q4 Y2
		- Monthly, by Contractor	5th day of the month following the effective month
		- Quarterly, by Contractor or by Licensed Laboratory	3rd day of the month following the effective quarter
	Operation Period (potentially could start even before DLP is over)		
	1.	Implementation of mitigation measures & monitoring activities as specified in the EMP	Starting anytime between Q3 Y3 & Q1 Y4
	2.	Submission of EMR	anytime between Q3 Y3 & Q1 Y4
		- Monthly, by Operator	5thday of the month following the effective month
		- Quarterly, by Operator or (if applicable) by Licensed Laboratory	3rd day of the month following the effective quarter

Source: IEE Study 2018/019

Table 36: Proposed Topics for Capacity Building/Training

Topic			Target Participants	Timing
1.	**By Environmental Specialists**			
	1.1	Legal Framework	DWSSM, PMO,	Early stage
		▪ Relevant national laws, regulations & standards on EA& management	WSSDO, ICG,	of Output 2
		▪ ADB SPS 2009	RMSO, WUSC (15-18)	
		▪ EA& review procedure under the Project		
	1.2	Environmental Assessment		
		▪ Rapid environmental assessment		
		▪ Initial environmental examination		
	1.3	Some Aspects of EA Process & Environmental Management		
		▪ Meaningful consultation & info disclosure		
		▪ Grievance redress mechanism		
		▪ Environmentally responsible procurement		
		▪ Occupational & community health and safety		
	1.4	EMP Implementation, part 1	DWSSM, PMO,	Early stage
		▪ Institution arrangements & responsibilities	WSSDO, ICG,	of Output 2
		▪ Environmental quality monitoring	RMSO, WUSC,	

Topic				Target Participants	Timing
		▪	Emergency response	(15-18)	
	1.5	EMP Implementation, part 2			
		▪	Performance monitoring & indicators		
		▪	Environmental monitoring report		
2.	**By External Experts**				
	2.1	Other relevant topics, such as:		M0WS, DWSSM,	During
		A	Good engineering and construction practices as mitigation measures	PMO, ICG,	Project's
		B	Climate change adaptation (applicable to eligible activities/works under the Project)	WSSDO, RMSO, DSMC (30)	Capacity Development Program
			B.1 Climate change impacts on infrastructure		
			B.2 Climate-proofing of infrastructure		
		C	Strategic environmental assessment of WSS sector policy, development plans, and programs		
		D	Other relevant topics that may be suggested by MoWS, DWSSM, PMO, ICG& WSSDO		

Source: IEE Study 2018/019

X. MONITORING & REPORTING

RPMO is the main monitoring agency of the proposed project that will monitor and measure the progress of EMP implementation with assistance from DMSC. The monitoring activities will correspond with the project's risks and impacts, and will be identified in the IEEs for the subprojects. In addition to recording information on the work and deviation of work components from original scope, PMO, RPMOs & DSMC will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome. Along with this, Ministry of Water Supply (MoWS) as well as Ministry of Forests & Environment (MoFS) under Government of Nepal will also undertake monitoring process through random field visits to review the project performance.

RPMOs will submit monthly monitoring and implementation reports to PMO, who will take follow-up actions, if necessary. PMO will submit semi-annual monitoring reports to ADB. This report will be based on the Sample Semi-Annual Monitoring Report Template given in ***Annex F*** and Sample Environmental Site Inspection Report given in ***Annex G***. The subproject budgets will reflect the costs of monitoring and reporting requirements.

For subprojects likely to have significant adverse environmental impacts, PMO will retain qualified and experienced external experts to verify its monitoring information. PMO environmental safeguard specialist will document monitoring results, identify the necessary corrective actions, reflect them in a corrective action plan, and for each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the PMO.

ADB will review project performance against the MoWS commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

(i) conduct periodic site visits for projects with adverse environmental or social impacts;

(ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;

(iii) review the periodic monitoring reports submitted by PMO to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;

(iv) work with PMO to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and

(v) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

XI. CONCLUSION

The IEE study indicates that:

- The proposed project, its components, are not within or adjacent to environmentally sensitive areas.
- The proposed project will fulfill the increasing water demand of the project town regarding the reliable water supply system. It will definitely address the issues raised by the hardship that people of the project town are facing for safe, reliable & potable water for years.
- The proposed project will bring about: (i) the benefits of easy access to reliable supply of safe and potable drinking water water; (ii) promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts; and (iii) enhanced community health, improved quality of life and safe communities as outcomes.
- Along with positive outcomes, the proposed project will also have negative impacts as discussed above in Chapter VI. As per our IEE study, four of the adverse impacts that includes *Air Pollution*, *Noise Pollution, Impacts on Water Quality of nearby rivers and Impact on Sustainability of Works* are evaluated as "Very Significant". However, these impacts would not be problematic for the project implementation if the activities that stimulate this impact to occur are properly controlled through the proposed mitigation measures.
- Some of the adverse impacts are also evaluated as *Significant*. However, these will not be sufficient to threaten or weaken the surrounding resources. Mitigation measures, integral to socially and environmentally responsible construction practices, will be commonly used at construction sites and the contractors will be aware about it. Hence, mitigation measures would not be difficult to implement.
- Similarly, Insignificant impacts can either be avoided or simply mitigated through the proposed mitigation measures.
- The environmental management plan (EMP) as described above in Chapter IX, if duly considered, followed and implemented during project construction activities, then the environmental issues will not be issues to be worried about.
- If the responsible body mentioned in the EMP matrix shown in the ***Table 31*** properly takes up the responsibility for the implementation of mitigation measures for the likely impacts resulting from the various activities of the project, then, the

environment of the project area will be safe and less affected from the project activities.

- Regular monitoring with good operation & maintenance service including prompt action on damage of the constrcuted drains if any; will lessen the risks of the ineffective implementation of the proposed project and will sustain the system.
- Construction of public toilets within the project town will improve the public behaviour regarding safe & civilized sanitation practices. It will help to maintain ODF status of the project town.
- None of the anticipated environmental impacts of the proposed project is significant enough to go for either detailed EIA study or further especial study.
- As per ADB Categorization, the proposed project falls under “Category B”. As per EPR 1997 (Latest Amendments 2017) Schedule H, this IEE study fulfills the requirements of IEE criteria. This IEE thus fulfills the policy requirements of both the ADB and the GoN. This indicates that IEE study is sufficient for the effective implementation of Panchkhal Water Supply & Sanitation Project.
- The IEE study shows that project benefits outweigh the risks and these potential risks can be overcome through proper planning and management.

Based on the above findings, the classification of the Panchkhal Water Supply & Sanitation Project as "Category B" is confirmed, no further special study or detailed EIA needs to be undertaken and people of Panchkhal Municipality will get rid of flooding problems during monsoons that they have been experiencing for decades.

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ANNEXES

Annex A

Rapid Environmental Assessment Checklist for Panchkhal Water Supply & Sanitation Project, Preliminary Climate Risk Screening Checklist, Other Checklists & Survey Questionnaires

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST FOR PANCHKHAL WATER SUPPLY & SANITATION PROJECT

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **NEP: Urban Water Supply and Sanitation (Sector) Project**

Subproject: **Panchkhal Water Supply & Sanitation Project**

Screening Questions	Yes	No	Remarks
A.Project Siting : Is the project area			
Densely populated?		√	Panchkhal Municipality has moderate population density.
Heavy with development activities?		√	.
Adjacent to or within any environmentally sensitive areas?			

Screening Questions	Yes	No	Remarks
Cultural heritage site		√	
Protected Area		√	
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?			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	
Hazard of land subsidence caused by excessive ground water pumping?		√	
Social conflicts arising from displacement of communities ?		√	
Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	
Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	√		Basic water treatment is proposed under the proposed project. EMP recommends water quality monitoring as prescribed in the NDWQS & its Directives.
Delivery of unsafe water to distribution system?	√		Design proposes office building that also comprises water quality laboratory to deliver safe water. EMP recommends continuing training of WUSC in water quality monitoring, as prescribed in the NDWQS Directives.
Inadequate protection of intake works or wells, leading to pollution of water supply?	√		Design has considered the safest site for intake regarding environmental pollution and proposes enough measures to mitigate contamination. There is also provision of protection works for intakes/sump wells.

Screening Questions	Yes	No	Remarks
Over pumping of ground water, leading to salinization and ground subsidence?		√	
Excessive algal growth in storage reservoir?		√	EMP provides mitigation measures.
Increase in production of sewage beyond the capabilities of community facilities?		√	EMP provides mitigation measures.
Inadequate disposal of sludge from water treatment plants?		√	Minimal sludge expected. EMP provides mitigation measures.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities.		√	
Impairments associated with transmission lines and access roads.	√		EMP provides mitigation measures.
Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	√		EMP provides mitigation measures.
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?		√	EMP provides mitigation measures
Dislocation or involuntary resettlement of people?		√	
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
Noise and dust from construction activities?	√		EMP provides mitigation measures.
Increased road traffic due to interference of construction activities?	√		EMP provides mitigation measures.

Screening Questions	Yes	No	Remarks
Continuing soil erosion/silt runoff from construction operations?	√		EMP provides mitigation measures.
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?	√		EMP incorporates monitoring of distributed water according to the Directives for the NDWQS.
Accidental leakage of chlorine gas?		√	EMP provides mitigation measures.
Excessive abstraction of water affecting downstream water users?		√	EMP provides mitigation measures
Competing uses of water?		√	
Increased sewage flow due to increased water supply		√	
Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		√	This is not under the scope of the project.
Large population influx during project construction and operation that causes an increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	
Social conflicts if workers from other regions or countries are hired?	√		Expected as low concern. Priority will be given to local workers.
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?	√		EMP provides mitigation measures.

Screening Questions	Yes	No	Remarks
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	√		EMP provides mitigation measures.

Preliminary Climate Risk Screening Checklist

Country/Project Title: Panchkhal Water Supply & Sanitation Project
Sector:
Subsector:
Division/Department:

	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	Investments in the proposed project will not likely be affected by climate change and extreme weather events due to the siting of project.
	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	
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, and hydro-meteorological parameters) affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
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	Regular operation and maintenance will not allow this effect to occur

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): _____
Other Comments:_____
_____
_____

Prepared by: _____

OTHER CHECKLISTS

A. Checklist for Physico-Chemical Environment

Parameters	Description
Topography	Latitude 26°33' N to 26°55' N and longitude 86°06' E to 86°26' E. Flat Topography with average elevation (110 to 120) m
Geology (Rock and Soil Types)	Sand, Silt & Clay are the main sediments of soil
Erosion and Sedimentation	No such events recorded and observed
Climate	Sub-tropical Climate Monsoon- June to September Average Rainfall: 1442mm
Quarry Sites (If any)	No
Land Use	Agricultural land is the dominant followed by forests and residential areas.
Air Quality	Medium
Noise Level	Medium
Drainage Network	Existing Drains at few locations

B. Floras & Fauna

Floras (Plant Life Forms)

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses		Protection Status		
							IUCN	CITES	GoN	IBAT
1	Aasuro	*Adhotoda vasica*	Nearby Forest	Shrub		Medicinal Use	LC	LC	LC	
2	Aiselu	*Rubus ellipticus*	Nearby Forest	Shrub		Medicinal Use, Fuel Wood, Fruits, Agroforestry	LC	LC	LC	
3	Amliso	*Thysanolaena maxima*	Human Habitations	Grass		Agroforestry and Making light & dust brooms	LC	LC	LC	
4	Bakaino	*Melia azedarach*	Along road and forest edges	Medium Sized Shrub or Tree		Edible Fruits, Agroforestry	LC	LC	LC	
5	Bans	*BabusaVulgaris*	Near Human Habitations as well as Open forests	Grass		Edible Shoots, Medicinal Uses, Agroforestry, Stems for making roof tiles, brooms & baskets, Handicrafts	LC	LC	LC	
6	Bar	*Ficus benghalensis*	Human Habitations	Tree		Medicinal Use, Edible Fruits & Agroforestry	LC	LC	LC	
7	Bot Dhaiyanro	*Lagerstroemia parviflora Roxb.*	Open grasslands	Tree		Edible Gum, Carpentry, Black Dye	LC	LC	LC	
8	Champ	*Magnolia champaca*	Nearby Forest	Tree		Edible fruits, Medicinal Uses, Agroforestry Uses, Making Perfumes, Dyeing and Oil Production	LC	LC	LC	
9	Chilaune	*Schima wallichii*	Nearby Forest	Tree		Medicinal Use, Agroforestry and	LC	LC	LC	

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses		Protection Status		
							IUCN	CITES	GoN	IBAT
						Dyeing				
10	Dhale Katus	*Castanopsis indica*	Forest Areas	Tree		Edible Seeds, Used as Bed logs in mushroom cultivation, Fuelwood, Making Charcoal	LC	LC	LC	
11	Dudhe Jhaar	*Euphorbia hirta*	Waste Places & Cultivated Fields near Human Habitations	Herb	Commonly Found	Edible leaves and Medicinal Uses	LC	LC	LC	
12	Dudhilo	*Ficus neriifolia*	Forest Areas	Tree		Medicinal Uses and Fodder	LC	LC	LC	
13	Gulaf	*Rosa rubiginosa*	Human Habitations (Urban and Rural Gardens)	Shrub	Commonly Found	Ornamental Uses, Commercial Perfumery, also used as landscape plants for hedging, slope stabilization etc.	LC	LC	LC	
14	Kafal	*Myrica esculenta*	Forests near human habitations	Large Shrub/Tree		Medicinal Use, Edible Fruits & Agroforestry				
15	Kalimunte	*Ageratina adenophora*	Nearby Forest	Shrub		Ornamental Uses, Medicinal uses				
16	Kamle	*Boehmeria platyphylla*	Nearby Forest	Grass		Edible Leaves & Roots, Medicinal Uses and Making ropes & cloths.				
17	Lajjavati	*Mimosa pudica L.*	Gardens, Croplands,	Weed		Medicinal Uses, and Agroforestry Uses				

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses		Protection Status		
							IUCN	CITES	GoN	IBAT
			Pastureland, Roadside near human habitations							
18	Lapsi	*Choerospondias axillaries*	Forest Areas near Human Habitations	Tree		Edible fruits, Medicinal Uses, Agroforestry Uses, Bark used for making ropes, Light construction works, Seed shells used as fuel for brick kiln	LC	LC	LC	
19	Paiyun	*Prunus ceratoides*	Forest Areas	Tree		Medicinal Use, Agroforestry Uses, Fuel Wood, Light Furniture and Household Utensils	LC	LC	LC	
20	Peepal	*Ficus religiosa*	Human Habitations	Tree		Medicinal Use, Fuel Wood and Religious	LC	LC	LC	
21	Sal	*Shorea robusta*	Nearby Forests	Trees		Medicinal, Making plates, cups (Tapari), Fuelwood, Edible Seeds	LC	LC	LC	
22	Sallo	*Pinus roxburghii*	Forest Areas	Tree		Ornamental Trees, Fuel Wood,	LC	LC	LC	
23	Sajivan/Kadam	*Origanum vulgare L.*	Ground Cover, Meadows and Cultivated Beds	Herb		Medicinal Uses, Edible leaves, Food Flavoring, making perfumes & soaps, Oil production to kill lices	LC	LC	LC	
24	Simali	*Vitex negundo*	Forest Areas	Shrub		Fuel Wood, Medicinal Use, Edible Seeds, Agroforestry	LC	LC	LC	

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses		Protection Status		
							IUCN	CITES	GoN	IBAT
25	Sisno	*Urtica dioica*	Forest Areas & Vegetated areas near Human Habitations, Roadsides	Herb/Flowering Plant		Culinary Use, Beverage Uses, Medicinal Uses and Gardening	LC	LC	LC	
26	Paulownia	*Paulownia Tomentos*	Roadsides, Stream Banks and Disturbed Habitat	Tree		As Ornamental Trees in parks & gardens, Making Musical Instruments and Seeds for making packaging material				
27	Titepati	*Attermesia vulgaris*	Waste Places (Uncultivated Places) and Roadsides	Herb		Medicinal Uses, Culinary Uses and Traditionally used for flavoring				
28	Uttis	*Alnus nepalensis*	Nearby Forests	Tree		Fuel Wood, Medicinal Use, Agroforestry, Dyeing, Tanning and Paper Manufacture				

Mammals in the project area

SN	Common Name	Scientific Name	Habitat	Local Status	Crop/Livestock Raider	Protection Status			
						IUCN	CITES	GoN	IBAT
1	Bengal Fox	*Vulpes Bengalensis*	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
2	Common Leopard	*Panthera pardus*	Forests		Livestock Raider	VU	VU	VU	VU
3	Five Stripped palm Squirrel	*Funambulus Pennantii*	Forests	Commonly Found	Crop Raider	LC	LC	LC	LC
4	Gray Wolf	*Canis lupus*	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC

SN	Common Name	Scientific Name	Habitat	Local Status	Crop/Livestock Raider	Protection Status			
						IUCN	CITES	GoN	IBAT
5	Golden Jackal	*Canis aureus*	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
6	Greater Short Nosed Fruit Bat	*Cynopterus sphinx*	Forests	Commonly found in forest areas	Crop Raider	LC	LC	LC	LC
7	Hare	*Lepus nigrcollis*	Forests	Commonly found in forest areas	No	LC	LC	LC	LC
8	House Rat	*Rattus Rattus*	Human Habitations	Commonly Found	Crop Raider	LC	LC	LC	LC
9	Jungle Cat	*Felis Chaus*	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
10	Jungle Rat	*Bandicota indica*	Forests & Agricultural Field	Commonly found in forest areas	Crop Raider	LC	LC	LC	LC
11	Long-winged Tomb Bat	*Taphozous longimanus*	Forests	Commonly found in forest areas	No	LC	LC	LC	LC
12	Masked Palm Civet	*Paguma Larvata*	Forests	Commonly found in forest areas		LC	LC	LC	LC
13	Nepal Gray Langur	*Semnopithecus schistaceus*	Forests	Commonly found in forest areas		LC	LC	LC	LC
14	Rhesus Monkey	*Macaca mulatta*	Forests	Commonly found in forest areas and in human habitations also	Crop Raider	LC	LC	LC	LC
15	Small Indian Mongoose	*Herpetes auropunctatus*	Forests and Agricultural Field	Commonly Found	No	LC	LC	LC	LC
16	Squirrel	*Funambulus sp.*	Forests	Commonly Found	Crop Raider	LC	LC	LC	LC
17	Wild Boar	*Sus Scrofa*	Forests		Crop Raider	LC	LC	LC	LC
18	Yellow Throated Marten	*Martes flavigula*	Forests		No	LC	LC	LC	LC

Birds Sighted in the project area

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
1	Barn Swallow	*Hirundo Rustica*	Swallow	Farmland & Settlement Areas	Commonly Found/LC	LC	LC	LC	LC
2	Black Drongo	*Dicrurus Macrocercus*	Passerine Bird	Farmland, Open Forests	Commonly Found/LC	LC	LC	LC	LC
3	Black Francolin	*Francolinus Francolinus*	Game Bird	Thick vegetation near water	Commonly Found/LC	LC	LC	LC	LC
4	Brown Headed Barbet	*Megalaima zeylanica*	Asian Barbet	Moist Broadleaf forests		LC	LC	LC	LC
5	Black Kite	*Milvus Migrans*	Diurnal Raptors	Settlement Areas with high human population		LC	LC	LC	LC
6	Cattle Egret	*Bubulcus Ibis*	Stocky Heron	Grasslands, Rice Paddy Fields, Wetlands, Farmlands		LC	LC	LC	LC
7	Chestnut Headed Bee Eater	*Merops Leschenaulti*	Near Passerine Bird	Highland Areas		LC	LC	LC	LC
8	Common Cuckoo	*Cuculus Canorus*	Cuckoo	Deciduous & Coniferous Forests, Woodland Areas, Meadows, Lowlands	Commonly Found	LC	LC	LC	LC
9	Common Hoopoe	*Upupa epops*	Coraciiform (Colorful Birds)	Farmlands		LC	LC	LC	LC
10	Common Myna	*Acridotheres tristis*	Tropical Bird	Human Habitations (Parks, Roadsides, Gardens) and Farmlands	Commonly Found	LC	LC	LC	LC
11	Common Stonechat	*Saxicola torquatus*	Saxicola (Small Passerine Birds)	Grasslands	Commonly Found	LC	LC	LC	LC
12	Crimson Sun Bird	*Aethopyga Siparaja*	Sunbird	Forest & Cultivated Areas	Commonly Found	LC	LC	LC	LC
13	Eurasian Tree Sparrow	*Passer Montanus*	Passerine Bird	Human Habitations	Commonly Found	LC	LC	LC	LC
14	Fulvous breasted Woodpecker	*Dendrocopus Macei*	Woodpeckers	Subtropical or Tropical Dry Forests and Lowland Forest		LC	LC	LC	LC

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
15	Great Tit	*Parus Major*	Passerine Bird	Forest Areas		LC	LC	LC	LC
16	Grey-headed Lapwing	*Vanellus cinereus*	Lapwing	Wet Grasslands and Rice Fields		LC	LC	LC	LC
17	House Crow	*Corvus Splendens*	Crow	Urban & Rural Habitats including towns, cities, farmlands	Commonly Found	LC	LC	LC	LC
18	House Sparrow	*Passer Domesticus*	Sparrow	Urban & Rural Habitats including towns, cities, farmlands	Commonly Found	LC	LC	LC	LC
19	Indian Cuckoo	*Cuculus micropterus*	Cuckoo	Deciduous & Evergreen Forests		LC	LC	LC	LC
20	Indian Peafowl	*Pavo Cristatus*	Peafowl	Moist Forest Areas		LC	LC	LC	LC
21	Indian Pond-Heron	*Ardeola Grayii*	Heron	Wetlands/Pond		LC	LC	LC	LC
22	Kalij Pheasant	*Lophura leucomelanos*	Pheasant	Forests		LC	LC	LC	LC
23	Large Billed Crow	*Corvus macrorhynchos*	Crow	Human Habitations		LC	LC	LC	LC
24	Lineated Barbet	*Megalaima lineate*	Asian Barbet	Holes at Tree trunks		LC	LC	LC	LC
25	Little Egret	*Egretta Garzetta*	Heron	Open Wetlands, Rice Fields		LC	LC	LC	LC
26	Oriental Magpie Robin	*Copsychus Saularis*	Passerine Bird	Urban gardens as well as Forests	Commonly Found	LC	LC	LC	LC
27	Oriental Turtle Dove	*Streptopelia orientalis*	Dove	Open habitats with good tree cover nearby human habitations	Commonly Found	LC	LC	LC	LC
28	Pied Bushcat	*Saxicola caprata*	Passerine Bird	Cultivated Lands, Grasslands		LC	LC	LC	LC
29	Plum headed Parakeet	*Psittacula cyanocephala*	Parrot	Forest Areas, Open Woodlands, City Gardens also		LC	LC	LC	LC
30	Red-vented Bulbul	*Pycnonotus cafer*	Bulbul (Passerine Birds)	Open Forests, Cultivated Lands		LC	LC	LC	LC
31	Rock Dove	*Columba Livia*	Dove/Common Pigeon	Open habitats with good tree cover nearby human habitations	Commonly Found and Abundant	LC	LC	LC	LC
32	Spotted Owlet	*Athene Brama*	Owl	Open habitats including farmlands and human habitations, City Areas	Commonly Found	LC	LC	LC	LC
33	Western (Asian)Koel	*Eudynamys Scolopaceus*	Cuckoo	Cultivated Lands, Forests		LC	LC	LC	LC

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
34	White Breasted Water Hen	*Amaurornis Phoenicurus*	Water Bird	Near Freshwater and Brackish Water		LC	LC	LC	LC
35	White Breasted Kingfisher	*Halcyon Smyrnensis*	Tree Kingfisher	Trees, Wires or other Perches		LC	LC	LC	LC
36	White Wagtail	*Motacilla Alba*	Small Passerine Bird	Near Water and even in urban areas, Stone Walls and Man-made structures	Commonly Found and Abundant	LC	LC	LC	LC
37	White Browed Wagtail	*Motacilla Mederaspatensis*	Wagtail	Open Freshwater Wetland		LC	LC	LC	LC
38	Yellow billed Blue Magpie	*Urocissa flavirostris*	Passerine Bird	Lowland Forests and Temperate Forests		LC	LC	LC	LC

Herpeto-fauna in the Project Area

S.N.	Local Name	Scientific Name	Habitat	Local Status	Protection Status			
					IUCN	CITES	GoN	IBAT
1	Common Indian Monitor	*Varanus Bengalensis*	Moist Forest Areas		LC	LC	LC	LC
2	Common toad/Himalayan Toad	*Bufo melanostictus/Duttaphrynus Himalayanus*	Shrubland near streams, Vicinity of seepage & fields		LC	LC	LC	LC
3	Garden lizard	*Calotes versicular*	Gardens, Agricultural Fields	Commonly Found	LC	LC	LC	LC
4	Green Pit Viper	*T. albolabris*	Small Bush Vegetations, Trees, Urban Areas also		LC	LC	LC	LC
5	House Lizard	*Hemidactylus Flaviviridis*	Human Habitations	Commonly Found	LC	LC	LC	LC
6	Olive Keelback Water	*Atretium Schistosum*	Water or Surrounding		LC	LC	LC	LC

S.N.	Local Name	Scientific Name	Habitat	Local Status	Protection Status			
					IUCN	CITES	GoN	IBAT
	Snake		Vegetation					
7	Rat snake	*Ptyas mucosus*	Forest Areas and Vegetaions near Human Habitations		LC	LC	LC	LC
8	Stream Frog	*Rana cyanophylectis*	Agricultural Fields, Roadsides,Freshwater, Vegetations near Human Habitations	Commonly Found	LC	LC	LC	LC

Fish in the Project Area

S.N.	Local Name	Scientific Name	Status of Occurrence	Migratory Status/Season	Observed Location
1	Catfish	*Glyptothorax indicus*		Resident Fish	Sunkoshi River/Jhiku Khola
2	Dinnawah Snowtrout	*Schizothorax progastus*		January to March	Sunkoshi River
3	Dwarf Sankehead	*Channa gachua*		Resident Fish	Sunkoshi River
4	Katli	*Neolissocheilus hexagonolepis*		January to March	Sunkoshi River
5	Spiny Eel	*Mastacembelus armatus*		Resident Fish	Sunkoshi River
6	Stone Carp	*Psilorhynchus pseudecheneis*		Resident Fish	Sunkoshi River
7	Stone Roller	*Garra* annandalei		Resident Fish	Sunkoshi River
8	Stinging Catfish	*Heteropneustes fossilis*		Resident Fish	Sunkoshi River

Note: All the above-mentioned floral & faunal species are found in various locations of the project town. Due to increasing urbanization, some of the species found within the settlement areas have now been increasingly shifted to the roadside bushes as well as nearby forests areas.

Survey Questionnaire

तेस्रो साना शहरी खानेपानी तथा सरसफाई क्षेत्रगत आयोजना
घरधुरी सर्वेक्षण प्रश्नावली

जिल्ला .... नगरपालिका / गा.वि.स .... वडा नं ....
नगर आयोजना: .... घर नं. ....
अन्तरवार्ता लिनेको नाम : .... अन्तरवार्ता मिति : ....
सुपरिवेक्षकको नाम : ....

१. सामाजिक-आर्थिक विवरण
(उपयुक्त कोठामा (√) को चिन्ह लगाउनु होस्)

१.१ अन्तरवार्ता दिनेको नाम :
१.२ घरमुलिको नाम .... लिङ्ग : पुरुष ☐ महिला ☐ ☐
१.३ यस परिवारमा अपाङ्गता भएको कुनै सदस्य हुनु हुन्छ: छ ☐ छैन
१.४ जातजातिमध्ये कुन हो: क) आदिवासी जनजाति ☐ ख) दलित ☐ ग) अल्पसंख्यक ☐ घ) अन्य ☐
(अन्तर्वार्ता लिनेले घरको आधारमा उपयुक्त वर्गमा चिन्ह लगाउने ।)
१.५ अन्तरवार्ता दिने व्यक्तिको नाता ....
१.६ यस परिवारका सदस्यहरुको विवरण दिनुस्

क.सं.	घरमुलिसितको नाता / नाम	उमेर	लिङ्ग	शिक्षा स्तर	पेशा
१					
२					
३					
४					
५					
६					
७					
८					
९					

नोट: पेशा : १ कृषि २ व्यापार ३ नोकरी ४ उद्योगधन्दा
५ रेमिटेन्स वैदेशिक रोजगार ६ ज्याला ७ अन्य
शिक्षा : १ निरक्षर २ साक्षर ३ प्राथमिकसम्म ४ माध्यमिकसम्म ५ एस.एल.सी. उत्तीर्ण
६ आई.ए. ७ बि.ए. ८ एम.ए. ९ अन्य

१.७ यस परिवारमा बसोबास गर्ने अन्य सदस्यहरुको सहयोगी डेरावाल कुल संख्या
१.८ यस नगर/शहरमा कहिले देखि बस्दै आउनु भएको छ ? वर्ष
स्थायी बसाइ सरेको बसाइ सरी आएको भए कुन जिल्लाबाट .... ?
१.९ बसाइ सर्नुको कारण: प्राकृतिक प्रकोप व्यापार/व्यवसाय शिक्षा द्वन्द्व जिविकोपार्जन सामाजिक विभाजन
१.१० कहिले देखि यस घरमा बस्दै आउनु भएको हो ? साल/वर्ष
१.११ यो घर आफ्नै हो ? हो होइन यदि हो भने हालको मूल्य कति होला अनुमानित रु.
ख) भाडामा बसेको हो होइन हो भने मासिक घर भाडा कति तिर्नुहुन्छ ? रु.
ग) सुकुम्बासी हो होइन
१.१२ यस घरमा भान्छा कोठा बाहेक अन्य कति वटा कोठाहरु छन् ?
१ कोठा २ कोठा ३ कोठा ४ कोठा वा सो भन्दा बढि
१.१३ घरको अवलोकन गरी घरको किसिम लेख्ने । पक्की अर्ध पक्की कच्ची
*(**पक्की** : छत ढलान, **अर्ध पक्की** : ईट्टा ढुङ्गाको गारो, टीनको छाना, ढुङ्गा, स्लेट, जस्ता, टायल आदि **कच्ची** : माटो गारो र खर टायलले छाएको)*
१.१४ यस परिवारसँग जग्गा जमीन छ ? छ छैन
यदि छ भने ५ रोपनी (०.२५ हेक्टर) भन्दा बढि वा ५ रोपनी भन्दा कम
१.१५ यहाँको जग्गाको किसिम: क) खेत वा बारी / असिंचित जग्गा .... बिघा/रोपनी
ख) खेत वा बारी / सिंचित जग्गा .... बिघा/रोपनी
१.१६ यहाँले गाई भैंसी पाल्नु भएकोछ ? छ छैन , छ भने कतिवटा ? एउटा दुईवटा वा बढि
१.१७ तपाईंको परिवारमा तल उल्लेखित कुन कुन सामान छन् ? (भएको सामानको संख्या लेख्ने)

क.सं.	सम्पत्ती	संख्या	कैफियत
१	साइकल/रिक्सा		
२	मोटरसाइकल		
३	बैलगाडा		
४	कार/जिप		
५	मिनिबस/बस		
६	ट्र्याक्टर/ट्रक		
७	रेडियो/क्यासेट		
८	टेलिभिजन/भिसिडी/सेट		

९	स्टोभ/ग्यास चुलो		
१०	रेफ्रिजेटर		
११	वासिङ मेसिन		
१२	वाटर फिल्टर		
१३	कम्प्युटर		
१४	इमेल/इन्टरनेटको पहुँच		
१५	अन्य भए उल्लेख गर्ने ।		

१.१८ यदि मूल पेशा कृषि भए कति महिना खान पुग्छ: ३ महिना ☐ ६ महिना ☐ १२ महिना ☐ यदि नपुग भएमा कसरी धान्नु हुन्छ ?
पसल/घरभाडा ☐ ऋण ☐ पेन्सन ☐ अन्य ☐

१.१९ तपाईको परिवारको औसत मासिक खर्च कति छ उल्लेख गर्नुहोस ।

खर्चको शिर्षक र किसिम	मासिक खर्च रु.	कैफियत
(क) कृषि तर्फ		
रसायनिक मल, बिउ, किटनाशक आदी खरिद गर्ने		
नर्सरीको तैयारी, रोप्ने, गोड्ने, बाली काट्ने, भित्र्याउने, ढुवानी र बिक्री गर्दा हुने खर्च		
अन्य भए (उल्लेख गर्नुस)		
(क) को जम्मा		
(ख) गैह्र कृषि तर्फ		
खाद्यान्न (अन्न र दैनिक उपभोग्य वस्तु)		
कपडा		
शिक्षा		
घर भाडा/घर मर्मत		
यातायात/संचार		
विद्युत		
पानी शोत/मर्मत सम्भार		
औषधि/उपचार (पानीबाट हुने रोग)		.... वार्षिक खर्च
औषधि/उपचार (अन्य रोग)		.... वार्षिक खर्च
अन्य, चाडपर्व कर्मकाण्ड संस्कार आदि उल्लेख गर्ने		.... वार्षिक खर्च
(ख) को जम्मा		
क+ख को कुल जम्मा		

१.२० तपाईको परिवारको औसत मासिक आय कति छ ? उल्लेख गर्नुहोस ।

आयस्रोत	संलग्न परिवार		प्राप्त हुने आय (रु. मासिक)	कैफियत
	पुरुष	महिला		
(क) कृषि तर्फ				
कृषि उत्पादनको बिक्रीबाट आय (मकै, गहुँ, धान, तरकारी, फलफुल)				
पशुजन्य उत्पादन (दुध, दही, घ्यु, खसी, कुखुरा आदि)				
(क) को जम्मा				
(ख) गैह्र कृषि तर्फ				
नोकरी / जागिर				
ज्याला मजदुरी				
पेन्सन/उपदान आदी				
वैदेशिक रोजगार (रेमिटेन्स)				
व्यापार/व्यवसाय				
उद्योग				
पसल/घर भाडा				
गाडी/ढुवानी व्यवसाय				
अन्य भए उल्लेख गर्ने				
(ख) को जम्मा				
क+ख कुल जम्मा				

१.२९ तपाईंको परिवारले कुनै ठूलो ऋण लिनु परेको छ ? छ [ ] [ ]

२. खानेपानी तथा सरसफाई व्यवस्थापन

२.१ तपाईंको परिवारको लागी खाना, खाना पकाउन, नुहाउन, भाँडावर्तन तथा लुगा धुनका लागी प्रयोग गरिने पानीको स्रोत एउटै हो ?
हो [ ] होइन [ ]

२.२ तपाईंको पानीको स्रोत कहाँ छ ? घर कम्पाउण्ड भित्रै [ ] सार्वजनिक स्थलमा [ ]

२.३ तपाईंको परिवारले पिउन, खाना पकाउनको लागी प्रयोग गर्ने पानीको स्रोत कुन हो ? दैनिक कति लिटर पानी खर्च हुन्छ ? कृपया तलको कोठामा ✓ चिन्ह लगाउनुहोस् ।

क.सं.	वर्षायाममा	✓	लिटर/ दैनिक	सुख्खा याममा	✓	लिटर/ दैनिक
१.	ईनार/ कुवा (खुल्ला)	Á		ईनार/ कुवा (खुल्ला)	Á	
२.	ईनार/ कुवा (ढक्कन भएको)	Á		ईनार/ कुवा ढक्कन भएको)	Á	
३.	ट्युवेल (हयाण्डपम्प)	Á		ट्युवेल हयाण्डपम्प	Á	
४.	डिप ट्युवेल	Á		डिप ट्युवेल	Á	
५.	ईनार/ कुवा मेसीनले तान्ने	Á		ईनार/ कुवा मेसीनले तान्ने	Á	
६.	सार्वजनिक धारा	Á		सार्वजनिक धारा	Á	
७.	निजी धारा	Á		निजी धारा	Á	
८.	मूल, खोला, नदी, पोखरी	Á		मूल खोला, नदी, पोखरी	Á	
९.	विक्रेतासँग पानी किनेर	Á		विक्रेतासँग पानी किनेर	Á	
१०.	वर्षातको पानी संकलन गरेर	Á		वर्षातको पानी संकलन गरेर	Á	
११.	अन्य	Á		अन्य	Á	
१२.	थाहा छैन	Á		थाहा छैन	Á	

२.४ दैनिक खानेपानी आवश्यक पूर्ति पानी संकलनकारि निम्न विस्तृत विवरण दिनुहोस् ।

क.सं	विवरण	वर्षा याममा				सुख्खा याममा			
		पुरुष	महिला	बालिका	बालक	पुरुष	महिला	बालिका	बालक
१	कति खेप/ पटक								
२	लिटर/ खेप								
३	कुल परिमाण								
४	पानी ल्याउन लाग्ने समय (मिनेट/ खेप)								
	• पानीको मुहान सम्म पुग्न								
	• मुहानमा पर्खनु पर्ने समय								
	• फर्केदा लाग्ने समय								
५	पूरै खेप लाग्ने समय								

***नोट :** अन्तरवार्ता दिने व्यक्तिले पानीको भाँडो तेरी बोक्ने क्षमता यकिन गरि उल्लेख गर्ने ।*

२.५ भाँडा माझ्न, नुहाउन र लुगा धुन तथा अन्य कामको लागी कुन स्रोतको पानी प्रयोग गर्नुहुन्छ ? कति पानी खपत गर्नुहुन्छ कृपया ☑ चिन्ह लगाउनुहोस् ।

क.सं.	वर्षायाममा	✓	लिटर/ दैनिक	सुख्खा याममा	✓	लिटर/ दैनिक
१	ईनार/ कुवा (खुल्ला)	Á		ईनार/ कुवा (खुल्ला)	Á	
२	ईनार/ कुवा ढक्कन सहित	Á		ईनार/ कुवा ढक्कन सहित	Á	
३	ट्युवेल हयाण्डपम्प सहित	Á		ट्युवेल हयाण्डपम्प सहित	Á	
४	डिप ट्युवेल	Á		डिप ट्युवेल	Á	
५	ईनार/ कुवा मेसीनबाट तान्ने	Á		ईनार/ कुवा मेसीनबाट तान्ने	Á	
६	सार्वजनिक धारा	Á		सार्वजनिक धारा	Á	

७	घरकै निजी धारा	A		घरकै निजी धारा	A	
८	मूल खोला, नदी, पोखरी	A		मूल खोला, नदी, पोखरी	A	
९	पानी बिक्रेतासँग किनेर	A		पानी बिक्रेतासँग किनेर	A	
१०	आकासे पानी संकलन गरेर	A		आकासे पानी संकलन गरेर	A	
११	अन्य	A		अन्य	A	
१२	थाहा छैन	A		थाहा छैन	A	

२.६ लुगा धुन र नुहाउन घरबाट पानीको मुहान सम्म जान कति समय लाग्दछ । (यदि श्रोत/मुहान छुट्टाछुट्टै भएमा समय (मिनेटमा) उल्लेख गर्नै)

क) लुगा धुन जाने ☐ नुहाउन ☐ भाँडा माझ्न ☐

ख) वर्षायाममा लाग्ने समय ☐ मिनेट सुख्खा याममा लाग्ने समय ☐ ट

२.७ यदि धाराको पानी यहाँको आवश्यकता परिपूर्तिगर्न पर्याप्त छैन भने कसरी आपूर्ति गर्नु हुन्छ?

पानीको श्रोत	परिमाण लिटर	खर्चनु पर्ने समय (घण्टा) दैनिक	थप खर्च मासिक
कुवा इनार			
आकासे पानी संकलन			
निजी टैंकरबाट पानी किन्ने			
ह्याण्ड पम्प,ट्युबवेल			
मिनरल वाटर जार			
अन्य			

२.८ गाईवस्तुको लागि चाहिने पानी कुन श्रोतबाट कति मात्रामा उपयोग गर्नुहुन्छ ।

क) प्रयोग भएको श्रोत..

ख) परिमाण (लिटर/दैनिक) ....

ग) श्रोतसम्म जान आउन लाग्ने समय (मिनेट)........................

३ निजी धारा जडान

३.१ के तपाईले घरमा पाइप धारा जडान गर्नु भएको छ ? छ ☐ छैन ☐ यदि छ भने कति खर्च लाग्यो: रु

३.२ के तपाई आफ्नो घरमा धारा जोड्न चाहनु हुन्छ ? चाहन्छु ☐ चाहन्न ☐ चाहनु हुन्छ भने कस्तो प्रक ☐ जडान गर्न इच्छा राख्नु हुन्छ ?

क) घरभित्र निजी धारा ☐

ख) कम्पाउण्डभित्र निजी धारा

ग) सामुदायिक धारा ☐ ☐

३.३ यदि तपाइको घरमा निजी धारा जडान भएको छैन भने, किन जडान नगरेको ?

क) खर्च गर्न क्षमता नभएकोले ☐

ख) जडान शुल्क धेरै पर्ने भएकोले ☐

ग) मासिक पानी बिल धेरै आउने भएकोले ☐

घ) पानीको मात्रा पर्याप्त नभएकोले ☐

ङ) पानीको आपूर्ति नियमित नभएकोले ☐

च) यस क्षेत्रमा पाइपलाइन जडान गर्ने व्यवस्था उपलब्ध नभएकोले ☐

छ) पानीको गुणस्तर राम्रो नभएकोले ☐

ज) अन्य कारण उल्लेख गर्ने ☐

झ) थाहा छैन ☐

३.४ हाल तपाईले पानजी धारा बापत गएको महिनामा पानीको महशुल कति तिर्नु भयो ? रु ☐

३.५ गएको महिनामा तिरेको बिल देखाउन सक्नु हुन्छ ? (बिल उपलब्ध भए सोको विवरण भर्ने) ☐

क) तिरेको रकम रु ☐ ख) खपत भएको पानीको मात्रा ☐ लिटर

३.६ पानीको बिल कु☐ तिर्नुहुन्छ (☑ चिन्ह लगाउनुहोस्) ☐

क) मासिक निश्चित लोकाको रकम ☐

ख) मिटर रिडिङ बमोजिम ☐

ग) खानेपानी कार्यालयले भने जति ☐

घ) तिर्नु पर्दैन ☐

ङ) अन्य ☐

च) थाहा छैन ☐

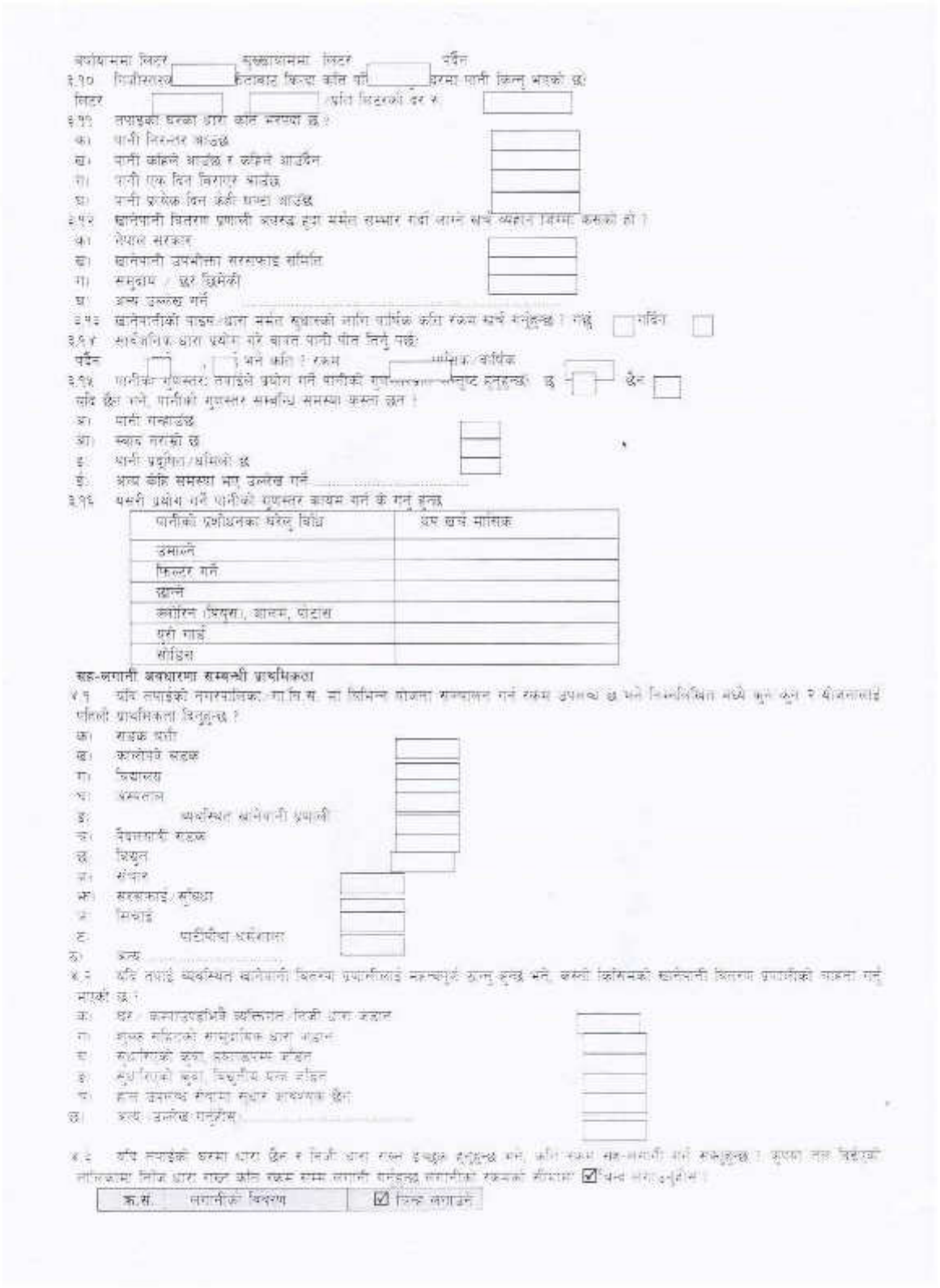
३.७ तपाईलाई पानीको बिल तिर्ने कुन तरिका मन पर्छ ? ☐

क) निश्चित लोकाको मासिक शुल्क ☐

ख) मिटर रिडिङ बिल अनुसार ☐

३.८ घरको धारामा पानी नआउँदा पनि पानी महशुल तिर्नु पर्छ ? पर्छ ☐

३.९ निजी धाराको पानी बाहेक तपाईले कहिले पनि पानी किन्नु गर्न भएको ☐ ☐ ☐



१	१५००० भन्दा माथी	☐
२	१०००१ देखि १५००० सम्म	☐
३	६००१ देखि १०००० सम्म	☐
४	३००१ देखि ६००० सम्म	☐
५	१५०१ देखि ३००० सम्म	☐
६	१५०० भन्दा कम	☐

४.४ निजी धारा जडान बापत लाग्ने शुल्क व्यहोर्नु पर्दछ मन्जुर छ ☐ मन्जुर छैन ☐

४.५ नयाँ खानेपानी योजना शुरु भएमा र सो योजनाबाट चौबीसै घण्टा पर्याप्त मात्रामा गुणस्तरयुक्त पानी उपलब्ध भएको खण्डमा के तपाईंले आफ्नो घरमा धारा जडान गर्न इच्छुक हुनु हुन्छ छ छैन

यदि इच्छुक भए नयाँ नियमानुसार मासिक पानी महशुल तिर्न ☐ बुझाउनु हुन्छ ☐

छ ☐ छैन ☐ यदि इच्छुक हुनु हुन्छ भने तल दिइएको तालिकामा पानी महशुलको सीमामा ☑ चिन्ह लगाएर आफ्नो ईच्छा व्यक्त गर्नुहोस।

क्र.सं.	मासिक पानी महशुल	☑ चिन्ह लगाउने
१	रु ५०० भन्दा माथी	☐
२	रु ४५१ देखि ५००	☐
३	रु ४०१ देखि ४५०	☐
४	रु ३५१ देखि ४००	☐
५	रु ३०१ देखि ३५०	☐
६	रु २५१ देखि ३००	☐
७	रु २०१ देखि २५०	☐
८	रु १५१ देखि २००	☐

४.६ नयाँ खानेपानी वितरण प्रणालीको व्यवस्था हुदा तपाईंको परिवारबाट पनि प्रतिबद्धता स्वरुप अग्रिम रकम योगदान गर्नु पर्ने हुन्छ, यसको विचारमा कति प्रतिशत योगदान हुन सक्छ।

लागतको ५% ☐ १०% ☐ १५% ☐

४.७ नयाँ सरसफाई सुविधा (सामुदायिक शौचालय तथा सतही ढल) निर्माणको लागि सह लगानी स्वरुप १५% स्थानीय निकाय र उपभोक्ताले सहलगानी गर्न इच्छुक हुनुहुन्छ? छ छैन

यदि चाहनुहुन्छ भने, कति सम्म? ☐ ☐

४.८ सहरलाई नयाँ [illegible] तथा [illegible] प्राथमिक आवश्यकता कुन हो?

निजी धारा जडान ☐ निजी चर्पी निर्माण ☐ दुबै ☐

५. लैङ्गिक दृष्टिकोणबाट महिला सहभागिता

आयोजनाको विभिन्न चरणमा महिला सहभागिता सम्बन्धि जानकारी संकलन गर्ने प्रत्येक घरधुरीमा, लक्षित समूह छलफलबाट र छुट्टै महिला समूहसँग मात्र सोधिने प्रश्नहरु।

क. महिलाहरुको उपस्थिति र सहभागीता

५.१ आयोजनाकोबारेमा छलफल गर्ने कुनै बैठक बोलाइएको थियो ?

थियो ☐ थिएन ☐

५.२ के आयोजनाको छलफल गर्ने बैठकमा महिला उपभोक्ताहरुको उपस्थिति थियो ?

थियो ☐ थिएन ☐

यदि थियो भने महिला उपभोक्ताहरुको भूमिका कस्तो थियो ?

मुक दर्शक निर्णयात्मक [illegible]

५.३ आफ्नो ☐ को [illegible] के खानेपानी उपभोक्ता ☐ तथा सरसफाई समिति गठन भएको छ ? छ ☐ छैन ☐

५.४ खा.पा.उ.स समितिमा सदस्यहरु मध्ये कति महिला सदस्यहरु छन्? [illegible] खा.पा.उ.स.स.मिति समितिको पदाधिकारी तथा सदस्यहरुको [illegible] विवरण [illegible] उपलब्ध गराउनुहोस्

ख. लैङ्गिकताका आधारमा कार्य विभाजन

५.५ तलको तालिकामा दिइएको कामहरु [illegible] गर्दछ? ✓ चिन्ह लगाउनुहोस्

दैनिक घन्टामा

क.सं	घरायसि क्रियाकलापहरु	पुरुष	महिला	कुल समय
१	खानेपानी भर्ने, बोक्ने, भण्डारण र प्रयोग गर्ने			
२	खाना तयार गर्ने, भाडा माझ्ने			
३	बालबालिका र बुढाबुढीको स्याहार			
४	लुगा धुने घर सफा गर्ने			
५	खाद्यान्न भण्डारण तथा तयारी			
६	अन्य			

ग) पारिवारिक व्यवस्थापन, आय श्रोत र अन्य विषयमा महिलाहरुको नियन्त्रण र पहुँच

५.६ तलको तालिकामा उल्लेखित पारिवारिक विषय वा क्षेत्रहरुमा निर्णय गर्दा यहाँको घर परिवारमा महिला/पुरुषको भनाइको सुनुवाई हुन्छ ? उपयुक्त कोठामा १,√०चिन्ह लगाउनुस

क.सं	विषय वा कार्यक्षेत्रहरु	हुन्छ १,√०	हुँदैन १,√०
१	आर्थिक सरोकारका कुराहरु		
२	केटाकेटीको शिक्षा दिक्षा		
३	केटाकेटी र बुढाबुढाको स्वास्थ्य र स्याहार		
४	अचल सम्पत्ति किनबेच (घर जग्गा)		
५	दैनिक क्रियाकलापहरु		
६	सामाजिक विधि व्यवहार, विवाह, व्रतबन्ध, चाडपर्व तथा सामाजिक/पारिवारिक सुसम्बन्धन आदि		
७	अन्य		

५.७ यहाँको परिवारमा पारिवारिक सम्पत्तिका निम्न विषयमा महिलाको पहुँच र स्वामित्व रहेको छ छैन तलको तालिकामा उपयुक्त कोठामा १,√०चिन्ह लगाउनुस

क.सं	विवरण	पहुँच	स्वामित्व
१	जग्गा जमिन		
२	घर तथा अन्य संरचनाहरु		
३	चल सम्पत्ति (संचित पैसा)		
४	दैनिक क्रियाकलापहरु		
५	अन्य		

घ) खा.पा.उ.स.स. तथा समुदायमा महिलाको स्तर (हैसियत) (निम्न बुँदाहरु अन्तरवार्ता लिने व्यक्तिले गरेको अवलोकनका आधार हुनेछ।)

क.सं	विवरण	उच्च	मध्यम	निम्न
१	आत्मसम्मानबोध			
२	आत्मविश्वास नेतृत्व शैलि			
३	दायित्वबोध र क्षमता			
४	व्याकल, तर्क संगत, धैर्य र मेहनत			
५	अन्य			

६. सम विकासमा पहुँचका आधारमा सामाजिक समावेशी सहभागिता

(आयोजनाको विभिन्न चरणमा गैरलाभान्वित विपन्न वर्गको, आदिवासी जनजाति, दलित तथा पछाडि परेका वर्गको समावेशी सहभागिता सम्बन्धि जानकारी संकलन गर्न प्रत्येक घरधुरीमा, लक्षित समूह छलफलबाट र छुट्टै महिला समूहसँग छलफल गर्दा सोध्ने प्रश्नहरु)

क) आयोजना क्रियाकलापमा गैरलाभान्वित विपन्न वर्गहरु, जातजाति, दलित, अपाङ्गता भएको व्यक्तिको उपस्थिति

६.१ आयोजनाकोबारेमा छलफल गर्ने कुनै भेला/बैठकमा समावेशी तवरले बोलाइएको थियो ?

थियो ☐ थिएन ☐

६.२ के आयोजनाको छनौट गर्ने बैठकमा समावेशीताको आधारमा सहभागीहरुको उपस्थिती थियो? थियो ☐ थिएन ☐

६.३ के खा.पा.उ.स.स.को गठनमा समावेशीता अंगिकार भएको थियो? थियो ☐ थिएन ☐

ख) निर्णय प्रक्रियामा समावेशी प्रकृया अपनाएको थियो ?

६.४ आयोजना छनौट गर्ने कामहरुमा कस्तो भूमिका कस्तो थियो ?

उच्च ☐ मध्यम ☐ निम्न ☐

६.५ खाना सहरी खानेपानी आयोजना कार्यान्वयन गर्ने सामाजिक समावेशी आधारमा उपभोक्ताहरुको परिचालन गर्न भएको प्रयास कस्तो थियो? राम्रो ☐ मध्यम ☐ निम्न ☐

७ स्वास्थ्य र सरसफाइ

क. खानेपानी

तपाईंको विचारमा पानीको गुणस्तर नराम्रो (खराब) भएमा के समस्याहरु देखिन सक्छ ?

(एक भन्दा बढी उत्तर आउन सक्ने)

७.१ दुर्गन्ध आउने / गन्हाउने स्वाद ☐

१.२ दाँत झिम्रिने/रंगीने
१.३ बिरामी बनाउने
१.४ अन्य (उल्लेख गर्ने) ....
२. के तपाईंलाई पानी भर्ने र राख्ने भाँडो पानी भर्नु र भण्डार गर्नु पूर्व सफा गर्नुपर्छ भन्ने थाहा छ ? छ ☐ छैन ☐
यदि छ भने, पानी राख्ने भाँडो कसरी सफा गर्ने हुन्छ ?
खाली पानी मात्रले ☐ खरानी पानीले ☐ भुस/पिठो र पानीले ☐
साबुन पानीले ☐ अन्य (उल्लेख गर्नुहोस्) ....
३. तपाईं घरमा पानी कसरी राख्नु हुन्छ ?
(एक भन्दा बढी उत्तर आउन सक्ने)
३.१ पानी भर्नु पहिले भाँडा सफा गर्ने ☐
३.२ बासी पानी फ्याल्ने ☐
३.३ पानी राख्ने भाँडो राम्रोसँग ढाकेर/छोपेर राख्ने ☐
३.४ अन्य (उल्लेख गर्ने) .... ☐
४. तपाईं गाग्री वा घैंटोबाट पानी कसरी निकाल्नुहुन्छ ?
४.१ पानी सार्नु अघि अम्खोरा, लौटा, करुवा, मग धोएर ☐
४.२ गिलास, मग, कप गाग्रीमा डुबाएर ☐
४.३ गाग्रीबाट लोटा, अम्खोरा, करुवा, गिलासमा पानी सारेर ☐
४.४ अन्य (उल्लेख गर्ने) .... ☐

ख. चर्पी

१. चर्पी प्रयोगका फाइदाहरु के के छन् ? (एकभन्दा बढी उत्तर आउन सक्ने)
१.१ वृद्धा, बालक तथा बिरामीलाई सुविधा ☐
१.२ घर तथा वातावरण सफा हुने ☐
१.३ गोप्यता हुने ☐
१.४ रोगबाट बचावट हुने ☐
१.५ अन्य (उल्लेख गर्ने) ....
२. के तपाईंलाई दिसाबाट रोग सर्छ भन्ने लाग्छ ? ☐ लाग्छ ☐ लाग्दैन
यदि लाग्छ भने, मानिसको दिसाबाट सर्ने रोगहरुको नाम भन्नुहोस् ? ....
३. के तपाईंको घरमा चर्पी छ ? छ ☐ छैन ☐
३.१ यदि छ भने, कस्तो प्रकारको चर्पी छ ? ☐
१ खाल्डे चर्पी
२ भेन्टिलेटेड खाल्डे चर्पी
३ वाटर सिल/पोर फ्लस
४ सिस्टर्न फ्लस
५ अन्य ....
३.२ यदि छ भने, तपाईंको घरमा चर्पी कसकसले प्रयोग गर्नुहुन्छ ? ☐
(१. सबैले, २. बच्चा बाहेक सबैले ३. वयस्क र प्रौढले मात्रै ४. बिरामी मात्रैले)
३.३ यदि छैन भने, किन चर्पी नबनाउनु भएको हो ? ☐
(क. बनाउने तरिका थाहा नभएर, ख. लगानी गर्न नसकेर, ग. खुल्ला मैदानमा दिसा गर्ने बानी भएर, घ. जग्गाको अभावले ङ. अन्य उल्लेख गर्ने ....)
३.४ यदि छैन भने, दिसा गर्न कहाँ जानुहुन्छ ? ☐
(क. खोला/जङ्गल/किनार ख. खुल्ला मैदान/बारी ग. घर/सडक छेउ घ. जहाँ सजिलो हुन्छ)
३.५ यदि छैन भने, चर्पी बनाउन कति लगानी गर्न सक्नु हुन्छ ? रु. ☐

ग. खानेकुराको सरसफाइ

१. खाद्यपदार्थ दूषित हुनबाट कसरी बचाउनुहुन्छ ? (एक भन्दा बढी उत्तर आउनसक्ने)
१.१ पकाएको खाना छोपेर/ढाकेर राख्ने ☐
१.२ बासी बढी गरी धेरै नपकाएर ☐
१.३ काँचै खाइने खानेकुरा राम्रोसँग पखालेर धोएर मात्र खाने ☐
१.४ हात राम्रो सफा गरेर मात्र भान्सामा पस्ने ☐
१.५ सफा भाँडामा खाना पस्केर ☐
१.६ भाँडा, मग, थाल, भाँडाकुँडा सफा गरेर मात्र खाना पस्कने, खाने ☐
१.७ धुलो, फोहोर पकाउने भाँडा, दराजहरु सफा राख्ने ☐
१.८ सँधै ताजा वा राम्रै गरेका फलफूल तरकारी खाने ☐
२. के तपाईं खानेकुरा छोपेर/ढाकेर राख्नुहुन्छ ? राख्छु ☐ राख्दिन
यदि राख्नुहुन्छ भने, त्यसबाट के के फाइदाहरु छन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
२.१ धुलो मैला, झिंगा, साङ्ला, किरा, तथा घरपालुवा पशुपन्छीबाट बचावट ☐
२.२ मुसा, छुचुन्द्रो, माउसुलि, बिरालोबाट रक्षा ☐
२.३ खाद्य प्रदूषणबाट हुने रोगबाट बच्न ☐

२.४ अन्य (उल्लेख गर्ने) ____________

जीवनजल बनाउने तरिका थाहा छ छैन सोध्ने, यदि थाहा भएमा सहि तरिकाले जीवनजल बनाउने । जीवनजल बनाउने सहि तरिका निम्नअनुसारको छ ।
१. पहिला साबुन पानीले हात सफा गर्ने, २. चिया गिलासको ६ गिलास (एक लिटर) पानी एउटा सफा भाँडोमा हाल्ने (यदि पानी उमालेको भएमा सेलाउन दिने), ३ जीवनजलको एक प्याकेटभित्र भएको धुलो पुरै पानीमा हाली पानीलाई राम्ररी चलाएर धुलोलाई घुल्न दिने ।

घ. व्यक्तिगत सरसफाइ

१. तपाईं र परिवारका अन्य सदस्यले कहिले र के गरेपछि हात धुनुहुन्छ ? धुने भए यस्तो (✓) चिन्ह लगाउनुहोस् र नधुने भए यस्तो (×) चिन्ह लगाउनुहोस । (एक भन्दा बढी उत्तर आउन सक्ने)

क्र. सं.	क्रियाकलाप	५ वर्ष मुनिका बालबालिका		महिला		पुरुष	
		धुने (✓)	नधुने (×)	धुने (✓)	नधुने (×)	धुने (✓)	नधुने (×)
१	खाना खानु अघि						
२	खाना खाएपछि						
३	दिसा गएपछि						
४	फोहर मैला छोएपछि						
५	कामबाट फर्केपछि						
६	केटाकेटीलाई दिसा पिसाब गराइ सकेपछि						
७	अन्य (उल्लेख गर्ने)						

२. तपाईं र परिवारका अन्य सदस्यले के ले हात धुनुहुन्छ ? धुनेमा यस्तो (✓) चिन्ह लगाउनुहोस् र नधुनेमा यस्तो (×) चिन्ह लगाउनुहोस ।

क्र. सं.	क्रियाकलाप	५ वर्ष मुनिका बालबालिका		महिला		पुरुष	
		धुने (✓)	नधुने (×)	धुने (✓)	नधुने (×)	धुने (✓)	नधुने (×)
१	पानी मात्रै						
२	खरानी पानी						
३	भुस/पिठो पानी						
४	साबुन पानी						
५	अन्य (उल्लेख गर्ने)						
जम्मा							

३. तपाईं र परिवारका अन्य सदस्यले कहिले कहिले नुहाउनुहुन्छ ?
नुहाउने भए यस्तो (✓) चिन्ह लगाउनुहोस र ननुहाउने भए यस्तो (×) चिन्ह लगाउनुहोस ।

क्र सं.	क्रियाकलाप	बालबालिका (✓) (×)	महिला (✓) (×)	पुरुष (✓) (×)
१	दैनिक दिन			
२	एक दिन बिराएर			
३	हप्तामा २ पटक			
४	हप्तामा १ पटक			
५	२ हप्तामा १ पटक			
६	महिनामा एक पटक			
जम्मा				

ङ. फोहर मैला व्यवस्थापन

१. तपाईंको घरबाट निस्कने ठोस फोहर मैला कहाँ विसर्जन गर्नुहुन्छ ?
१.१ घर नजिक खाल्डोमा
१.२ निजी फोहर संकलनकर्तालाई दिने
१.३ ना.वि.स. /नगरपालिकाले व्यवस्था गरेको खाल्डो वा स्थानमा
१.४ अन्य (उल्लेख गर्ने)

२. ठोस तथा तरल फोहर वस्तुलाई अव्यवस्थित तरिकाले विसर्जन गर्दाले हुने नराम्रा असरहरु के के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
२.१ फोहोर वातावरणमा वृद्धि
२.२ लामखुट्टे, झिंगा, किराहरुको वृद्धि

२.३ रोग सर्नमा वृद्धि
२.४ अन्य (उल्लेख गर्ने) ....

३. तपाईंको घरबाट निस्कने फोहोर पानी कहाँ विसर्जन गर्नुहुन्छ ?
३.१ खाल्डोमा/व्यवस्थित ढङ्गले
३.२ सरकारी धारामा/करेसा बारीमा
३.३ सार्वजनिक ढलमा
३.४ अन्य (उल्लेख गर्ने) ....

च. वस्तुभाउको फोहर व्यवस्थापन

१. के तपाईंले वस्तुभाउ पाल्नु भएको छ ? छ छैन
(यदि छैन भने पानी जन्य सरुवा रोगमा जाने)
यदि छ भने कुन कुन प्रकारका छन् र तिनीहरूलाई कहाँ राख्नु हुन्छ ?

क्र.सं	वस्तुभाउको प्रकार	घरभित्रै राख्ने	बाहिर छुट्टै गोठमा राख्ने
१	गाई/भैंसी		
२	बंगुर/सुंगुर		
३	बाख्रा		
४	कुखुरा/हाँस		
५	अन्य		

२. वस्तुभाउबाट निस्कने फोहोर कहाँ र कसरी विसर्जन गर्नुहुन्छ ?
२.१ मलखादमा
२.२ आगो बाल्ने/गुईंठा बनाउने
२.३ गोबर ग्यास प्लान्टमा प्रयोग गर्ने
२.४ अन्य (उल्लेख गर्ने) ....

३. वस्तुभाउको फोहोर मैलाको जथाभावि अव्यवस्थित तवरले विसर्जन गर्दा हुने खराब असरहरु के के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
३.१ वातावरणीय प्रदूषणमा वृद्धि हुने
३.२ लामखुट्टे, झिंगा, किराहरूको वृद्धि हुने
३.३ रोगव्याधि बढ्ने तथा सर्ने
३.४ गाउँ, छरछिमेक तथा नगर अशोभनिय देखिने
३.५ अन्य (उल्लेख गर्ने) ....

छ. पानीजन्य सरुवा रोगहरु

१. पानीजन्य सरुवा रोगको कारणहरु के के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
१.१ दूषित पानी प्रयोग गर्दा
१.२ दूषित खाना खाँदा
१.३ घर तथा सार्वजनिक स्थलमा फोहर बढ्नाले
१.४ मानिसको मलमूत्र जथाभावी फ्याल्ने गर्दा
१.५ फोहोर मैला जथाभावी फ्याँक्ने गर्दा
१.६ स्वास्थ्य शिक्षा तथा स्वस्थ बानीको अभाव
१.७ सरसफाई र स्वास्थ्य सम्बन्धी ज्ञान र चेतनाको अभावले
१.८ अन्य ....

२. तपाईंको परिवारमा कोही बिरामी परेमा के गर्नुहुन्छ (प्राथमिकता अनुसार नम्बर लेख्ने)
२.१ घरायसी उपचार गर्ने
२.२ धामी, झाँक्री, पुजारी कहाँ जाने
२.३ औषधि पसलमा जाने
२.४ स्वास्थ्य चौकि वा अस्पतालमा जाने
२.५ अन्य (उल्लेख गर्ने)

३. यदि परिवारमा कसैलाई झाडापखाला लागेमा के गर्नुहुन्छ ? (प्राथमिकता अनुसार नम्बर लेख्ने)
३.१ जीवनजल खुवाउने
३.२ घरायसी उपचार गर्ने
३.३ धामी, झाँक्री वा पुजारी कहाँ जाने
३.४ औषधि पसलमा जाने
३.५ स्वास्थ्य चौकि वा अस्पतालमा जाने
३.६ अन्य (उल्लेख गर्ने) ....

४. गत एक वर्षभित्र परिवारका सदस्यहरु तलका रोगहरु मध्ये कुन कुन रोगबाट बिरामी भए ? (सोधिईदिने भी मिलाउ)
५. तपाईंको परिवारमा पानीजन्य निम्नलिखित सरुवा रोगबाट कोहि बिरामी परेको विवरण तलको तालिकामा संख्या उल्लेख गर्नुस् ।

क्र. सं.	रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष	थपिएका खर्च रु.
१	झाडापखाला				
२	आउँ				
३	झुकी				
४	टाईफाईड				
५	हैजा				
६	छाला सम्बन्धी रोग				
७	मौलोरोग (मलेरिया)				
८	कमलपित्त (जण्डीस)				
९	अन्य				
	जम्मा				

६. गत एक वर्षभित्र तपाईको परिवारमा कोही झाडा पखाला तथा पानीजन्य अन्य सरुवा रोगबाट मृत्यु भएको छ ? (मृत्यु अवस्था)

रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष
झाडा पखाला			
आउँ			
पानीजन्य अन्य सरुवा रोगहरु			
जम्मा			

७. गत एक वर्षभित्र तपाईको परिवारका सदस्यलाई झाडापखाला र पानीजन्य अन्य सरुवा रोगहरुको उपचारमा कति रकम खर्च गर्नु भयो ?

रोग	खर्च रकम रु.मा			
	१००० सम्म	१००१–३०००	३००१–५०००	५००० भन्दा माथि
झाडापखाला				
पानीजन्य अन्य सरुवा रोगहरु				
जम्मा				

सहयोगका लागी धन्यवाद ।

Annex B
Relevant Environmental Quality Standards

National Ambient Air Quality Standards for Nepal, 2003

Parameter	Averaging Period	Nepal's Ambient Air Quality Standard ($\mu g/m^3$) *	WHO Air Quality Guidelines ($\mu g/m^3$) **	
			Global Update 2005	Second Edition ^ 2000
TSP	Annual	-	-	-
	24-hour	230	-	-
PM_{10}	Annual	-	20	-
	24-hour	120	50	-
$PM_{2.5}$	1-year	-	10	-
	24-hour	-	25	-
SO_2	Annual	50	-	
	24-hour	70	20	-
	10-minute	-	500	-
NO_2	1-year	40	40	-
	24-hour	80	-	-
	1-hour	-	200	-
CO	8-hour	10,000	-	10,000
	15-minute	100,000	-	100,000
Pb	1-year	0.5	-	0.5
Benzene	1-year	20	-	-

* National Ambient Air Quality Standards for Nepal, 2003. Obtained from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

** Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

^ Air Quality Guidelines for Europe, Second Edition, 2000. WHO Regional Office for Europe, Copenhagen.

Parameter that either has no national standard value for 24-hour observation or with WHO guideline value for 24-hour observation as more stringent than that specified in the national standards.

National Noise Standard Guidelines, 2012

Receptor / Source	National Noise Standard Guidelines, 2012 (dB)		WHO Guideline Values for Noise Levels Measured Out of Doors * (One Hour L_{Aeq} in dBA)	
	Day	Night	07:00 - 22:00	22:00 - 07:00
Industrial area	75	70	70	70
Commercial area	65	55		
Rural residential area	45	40	55	45
Urban residential area	55	50		
Mixed residential area	63	55		
Quiet area	50	40	-	-
Water pump	65		-	
Diesel generator	90		-	

* Guidelines for Community Noise, WHO, 1999.

Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

Tolerance limits for wastewater to be discharged into inland surface waters from combined wastewater treatment plant (generic standards)

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

Annex C
Sample Grievance Redress Form

Sample Grievance Redress Form

(To be available in Nepalese and English)

The_____Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enables us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information remain confidential, please inform us by writing/typing* (CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration			
Contact Information/personal details				
Name	Gender	*Male *Female	Age	
Home Address				
Place				
Phone No.				
E-mail				
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If includes as attachment/note/letter, please tick here:				
How do you want us to reach you for feedback or update on your comment/grievance?				

FOR OFFICIAL USE ONLY

Registered by: (Names of official registering grievance)	
Mode of communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/positions of official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

Annex D
Sample Traffic Management Plan

A. Principles

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
(v) Avoid hazards in
(vi) Addressing issues that may delay the project.

B. Operating Policies for TMP

The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

(i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
(ii) Inhibit traffic movement as little as possible.
(iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
(iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
(v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
(vi) Train all persons that select, place, and maintain temporary traffic control devices.
(vii) Keep the public well informed.
(viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

C. Analyze the impact due to street closure

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

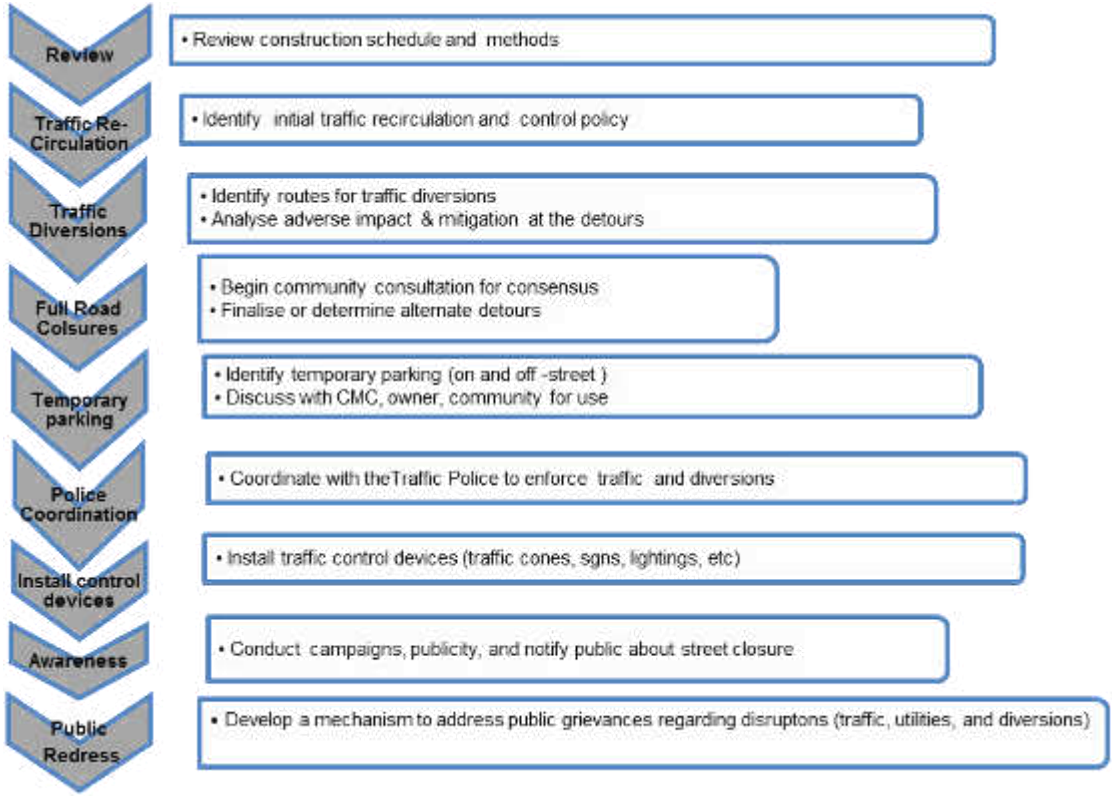
(i) approval from the ICG, local administration to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining of the 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.

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 Saturday night and ending on Monday morning prior to the morning peak period.

Figure A1: Policy Steps for the TMP



D. Public awareness and notifications

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.

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 public notices, ward level meetings and city level meeting with the elected representatives.

The ICG 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.

It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools 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 ICG, 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) Advise 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 (name, telephone, mobile number of the contact person; and
(vi) Indicate the office hours of relevant offices.

E. Vehicle Maintenance and Safety

A vehicle maintenance and safety program shall be implemented by the construction contractor. The contractor should ensure that all the vehicles are in proper running condition and it comply with roadworthy and meet certification standards of GoN. All vehicles to be used at STWSSP shall be in perfect condition meeting pollution standards of GoN. The vehicle operator requires a pre state of shift checklist. Additional safety precautions will include the requirement for:

- Driver will follow the special code of conduct and road safety rules of Government of Nepal.
- Drivers to ensure that all loads are covered and secured drivers to ensure operation equipment can’t leak materials hauled
- Vehicles will be cleaned and maintained in designed places.

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

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 them 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. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings

- Channelizing Devices
- Arrow Panels
- Warning Lights

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 along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. 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 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 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.

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. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

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.

The ICG and contractor will coordinate with the local administration and traffic police regarding the traffic signs, detour, and any other matters related to traffic. The contractor will prepare the traffic management plan in detail and submit it along with the EMP for the final approval.

Annex E
Spoil Management Plan

Purpose and application: SMP is to describe how STWSSP will manage the spoil generated and reuse related to design and construction works. This is an integral part of EMP. The objective of SMP is to reuse of spoil from works in accordance with the spoil management hierarchy outlined in this document.

Objectives of SMP: The objectives of SMP are:

- **A** To minimize spoil generation where possible
- **B** Maximize beneficial reuse of spoil from construction works in accordance with spoil management hierarchy
- **C** Mange onsite spoil handling to minimize environmental impacts on resident and other receivers
- **D** Minimize any further site contamination of land, water, soil
- **E** Manage the transportation of spoil with consideration of traffic impacts and transport related emissions

Structure of SMP:

Section 1: Introduction of SMP
Section 2: Legal and other requirements
Section 3: Roles and responsibilities
Section 4: Identification and assessment of spoil aspects and impacts
Section 5: Spoil volumes, characteristics and minimization
Section 6: Spoil reuses opportunities, identification and assessment
Section 7: On site spoil management approach
Section 8: Spoil transportation methodology
Section 9: Monitoring, Reporting, Review, and Improvements

Aspects and potential impacts

The key aspects of potential impacts in relation to SMP are listed in table below

Aspects	Potential Impacts
Air Quality	Potential for high winds generating airborne dust from the stock piles
Sedimentation	Potential for sediment laden site runoff from spoil stockpiles and potential for spillage of spoil from truck on roads
Surface and groundwater	Contamination of surface and ground water
Noise	Associated with spoil handling and haulage and storage
Traffic	Impacts associated with spoil haulage
Land Use	Potential for spoil to be transported to a receivable site that doesn't have permission for storage/disposal
Design specifications	Limitations on opportunities to minimize spoil generation
Sustainability	Limited sites for storage reuse opportunities

Spoil volumes, Characteristics and Minimization

Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.

Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials

Adopt Spoil Reduce, Reuse Opportunities: An overview of the assessment methodology to be used is mentioned below.

- Consideration of likely spoil characteristics
- Identification of possible reuse sites
- Screening of possible reuse opportunities

Identification of possible safe disposal sites for spoil: Those spoils, which can't be reuse, shall be properly disposed in designated areas, such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects, there should not be any legal, and resettlement related issues. Such areas need to be identified and prior cliental approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

Storage and Stockpiling Transportation and Haulage route

Based on the above, the contractor will prepare a SMP as an integral part of EMP and submit it to the DSC for their review and approval.

SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

Appendixes

F Photos

G Summary of consultations

H Copies of environmental clearances and permits

I Sample of environmental site inspection Report

J Others

Annex F
Sample Semi-Annual Environmental Monitoring Report Template

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.

a. Introduction
b. Overall project description and objectives
c. Description of sub-projects
d. Environmental category of the sub-projects
e. Details of site personnel and/or consultants responsible for environmental monitoring
f. 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		
		! !	! !	! !	! !		
		! !	! !	! !	! !		

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

COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

a. Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
b. 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:
c. What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;
d. If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
e. 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;

f. Are their designated areas for concrete works, and refueling;
g. Are their spill kits on site and if there are site procedure for handling emergencies;
h. Is there any chemical stored on site and what is the storage condition?
i. Is there any dewatering activities if yes, where is the water being discharged;
j. How are the stockpiles being managed;
k. How is solid and liquid waste being handled on site;
l. Review of the complaint management system;
m. 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 CEMP/EMP

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

APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each sub-project

MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

a. Brief discussion on the basis for monitoring
b. Indicate type and location of environmental parameters to be monitored
c. Indicate the method of monitoring and equipment to be used
d. 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)

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)

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Annex G
Sample Environmental Site Inspection Report

Project Name
Contract Number

NAME: _____
DATE:_____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER CONDITION:
_____

INITIAL SITE CONDITION:_____

CONCLUDING SITE CONDITION:

Satisfactory_____Unsatisfactory_____ Incident_____ Resolved _____ Unresolved _____

INCIDENT:
Nature of incident:
_____
Intervention Steps:
_____
Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions		Waste Minimization		
Air Quality		Reuse and Recycling		
Noise pollution		Dust and Litter Control		
Hazardous Substances		Trees and Vegetation		
Site Restored to Original Condition	Yes		No	

Signature
_____

Sign off

_____ _____

Name **Name**
Position **Position**

Annex H
Minutes of Meeting & Public Consultations

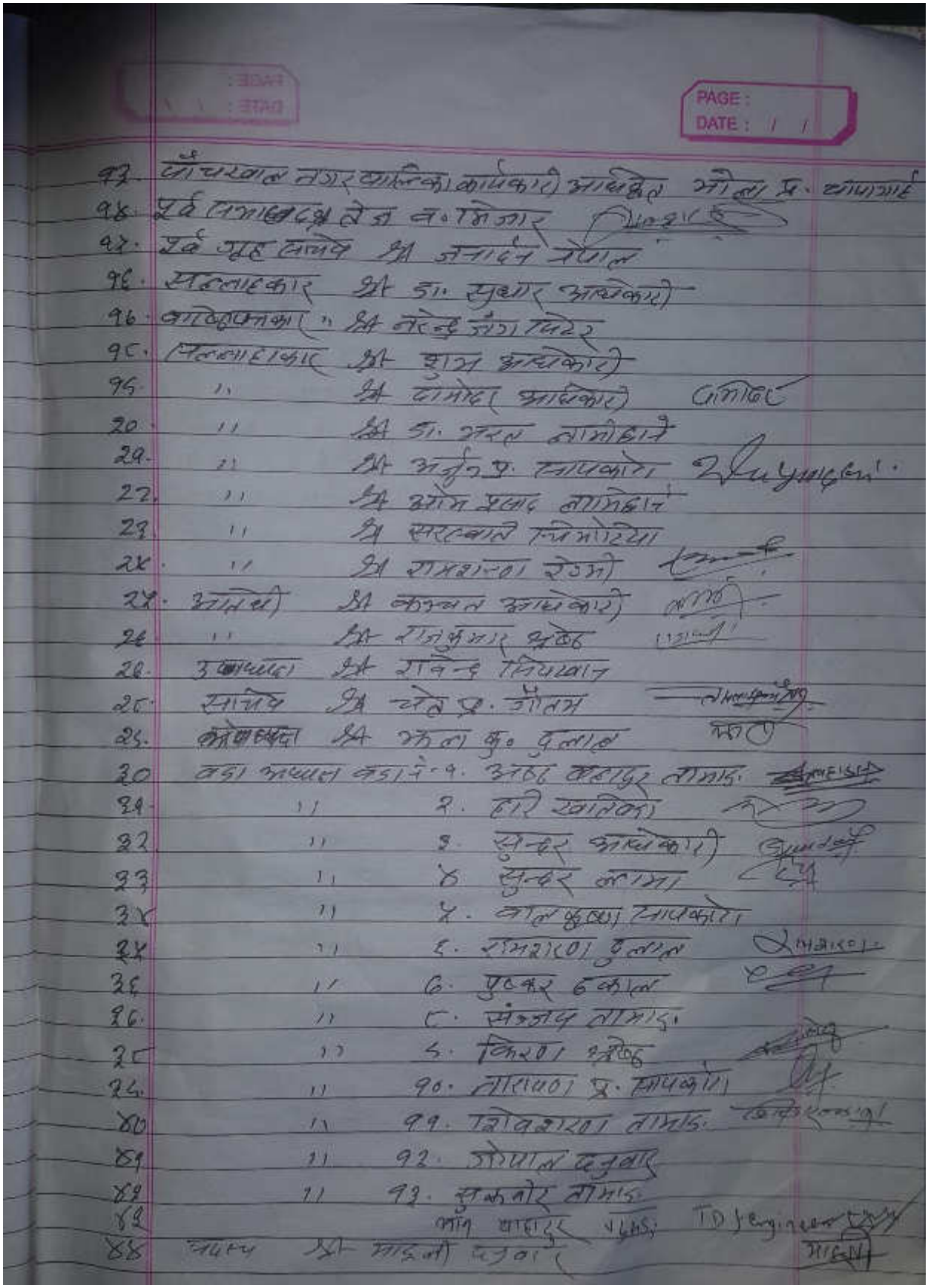
PAGE :
DATE : / /

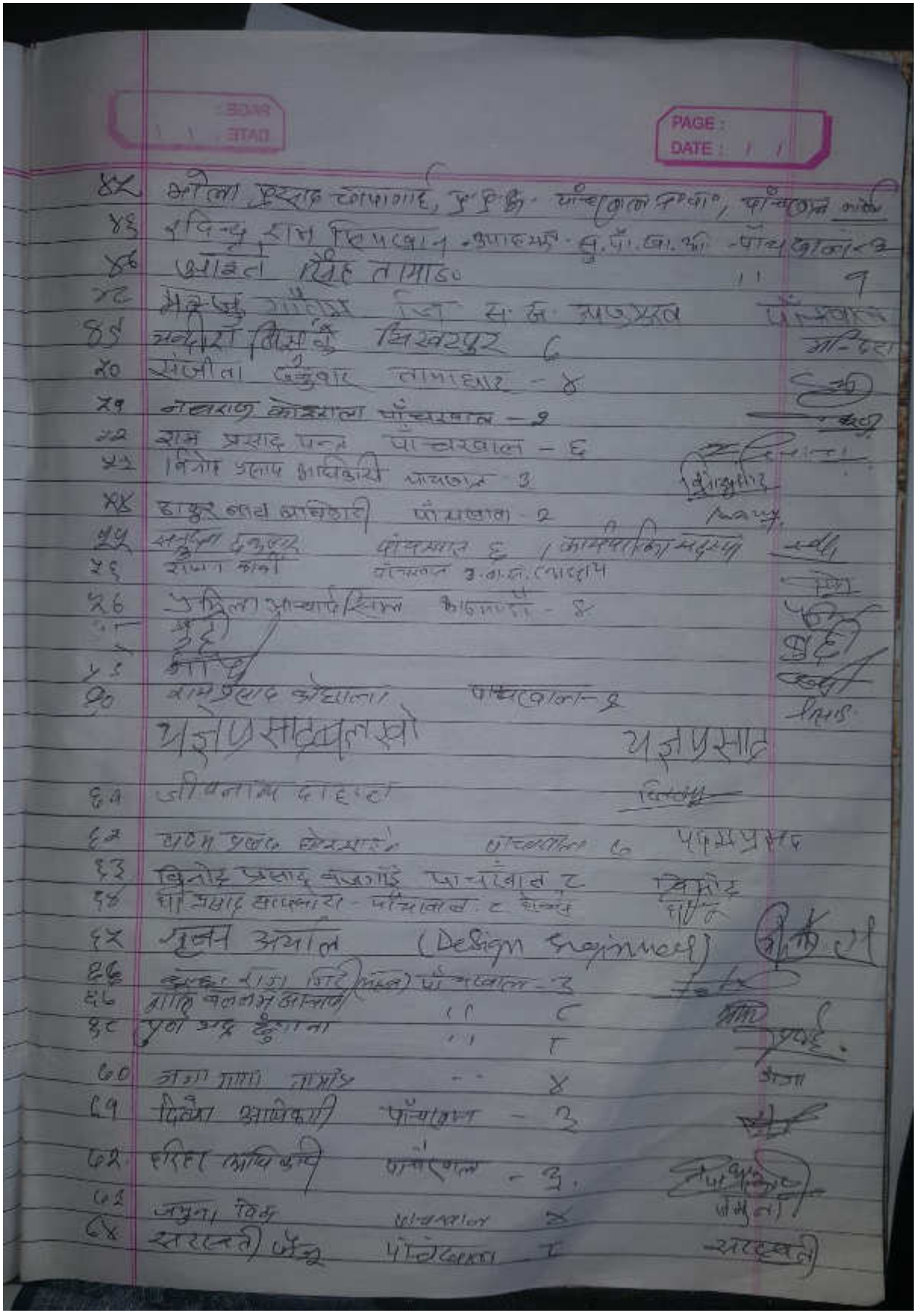
मिति :- २०७५/०६/२०

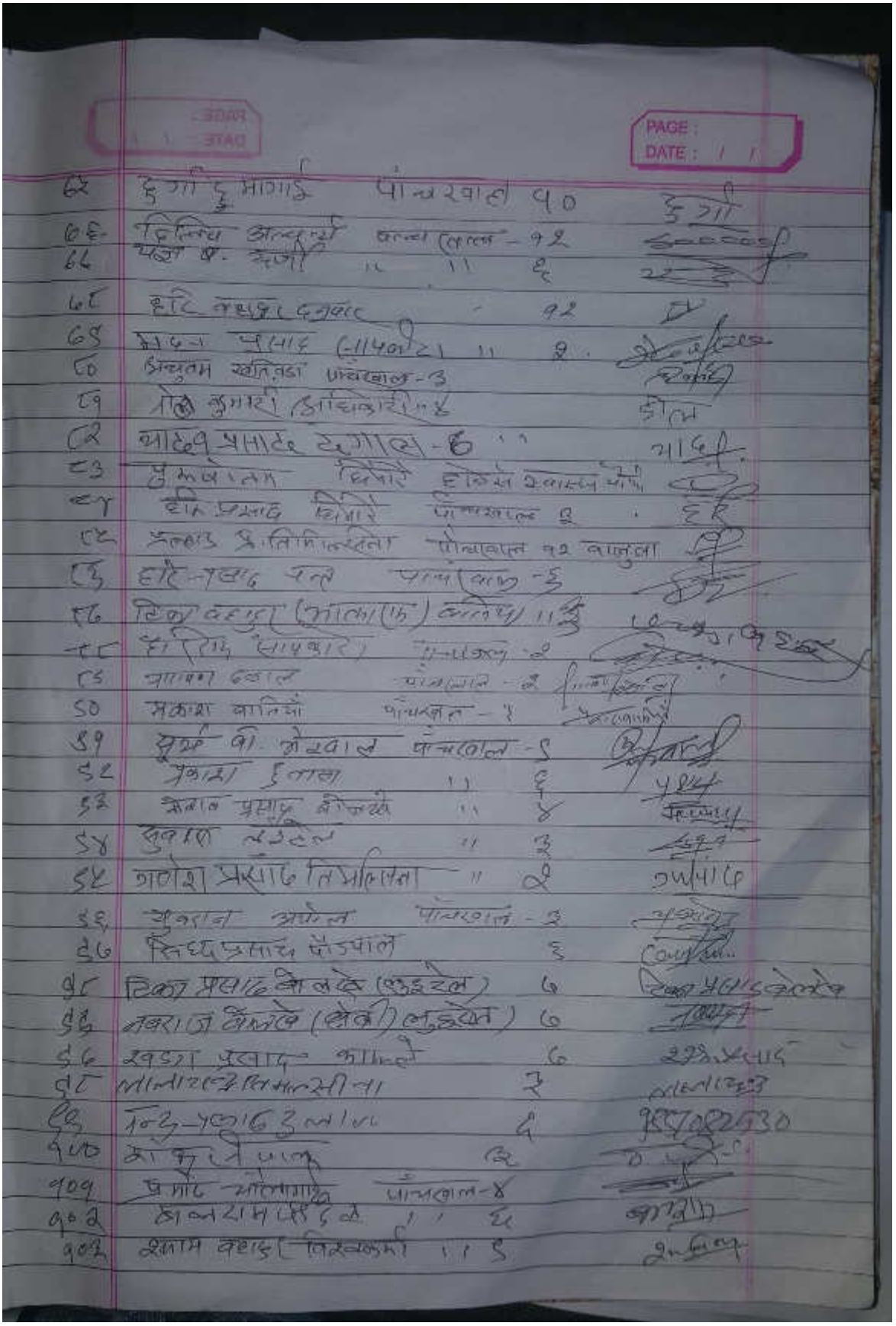
आज मिति २०७५ साल आश्विन २० गतेका दिन पाँचखाल नगरको गौरवको योजना सुनकोशी पाँचखाल खानेपानी योजना कार्यान्वयनको लागि आयोजित वृहत उपभोक्ता भेला सुनकोशी पाँचखाल खानेपानी उपभोक्ता समितिका अध्यक्ष कुमार प्र. नामिछानेको अध्यक्षतामा र सूचना तथा संचार मन्त्री माननीय श्री गोकुल प्रसाद बाँस्कोटाको प्रमुख आतिथ्यतामा तथा अन्य विशिष्ट अतिथि र आमन्त्रितहरूको उपस्थितिमा यस पाँचखाल नगरको वृहत उपभोक्ता भेला सम्पन्न भयो। जसको उपस्थिति निम्न प्रकार छ।

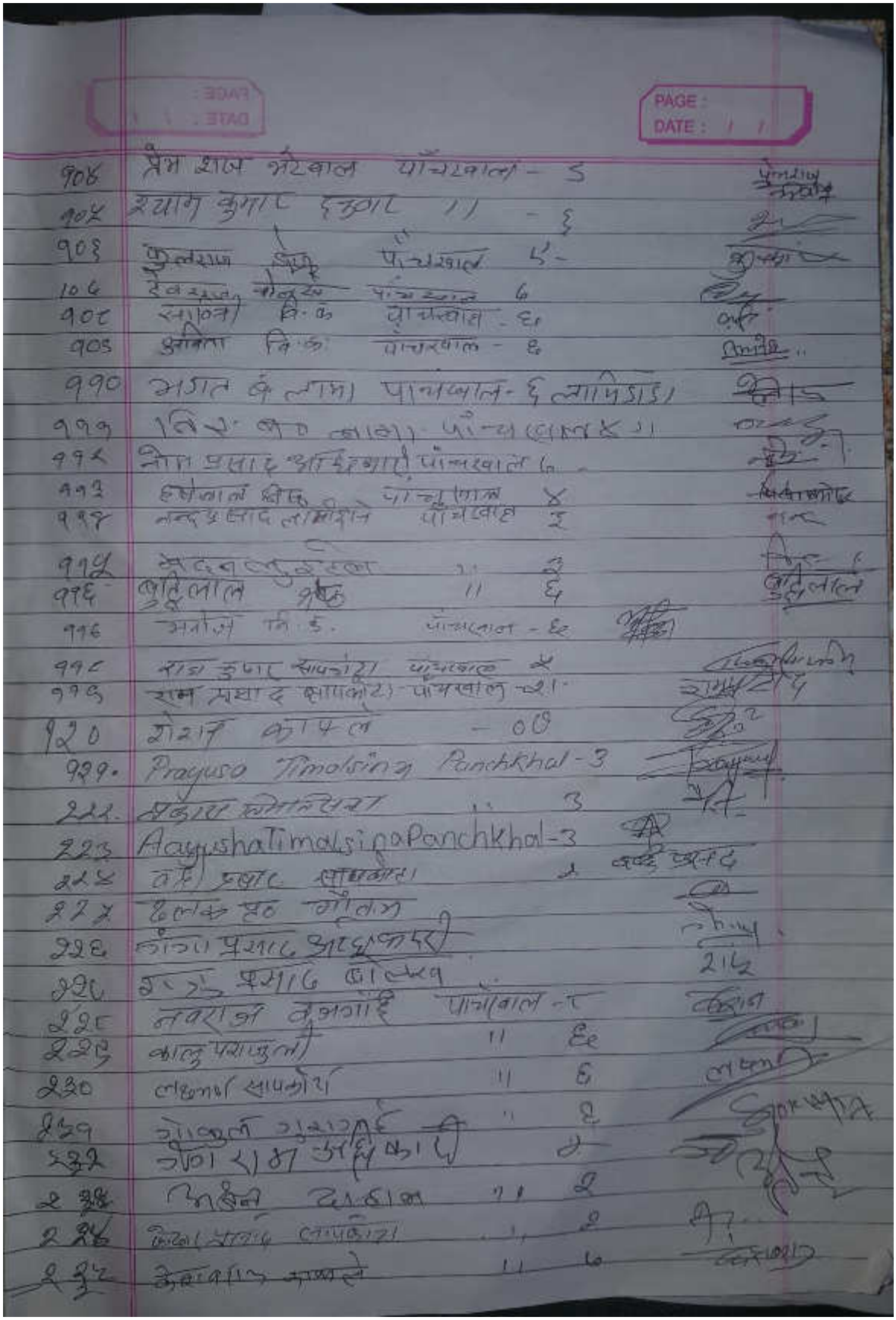
उपस्थिति :

१. सभापतित्व श्री कुमार प्र. नामिछाने
२. प्रमुख अतिथि सूचना तथा संचार मन्त्री माननीय श्री गोकुल प्र. बाँस्कोटा
३. विशिष्ट अतिथि काभ्रे क्षेत्र नं. २ क प्रदेशसभा सांसद माननीय श्री लक्ष्मण लम्साल
४. विशिष्ट अतिथि पाँचखाल नगरपालिकाका नगर प्रमुख श्री महेश खरेल
५. अतिथि जिल्ला समन्वय समिति काभ्रेका उपसंयोजक श्री मञ्जु गौतम (पौडेल)
६. अतिथि पाँचखाल नगरपालिका उपप्रमुख श्री लक्ष्मी देउवार
७. अतिथि तेस्रो साना शहरी खानेपानी तथा सरसफाई परियोजना कार्यक्रम निर्देशक श्री राजेन्द्र सापकोटा
८. नगर विकास कोष अध्यक्ष ध्रुव रिजाल
९. प्राविधिक (आयोजना प्रमुख) अधिकृत सुबल राज पन्त
१०. कन्सल्टेन्ट विनोद चन्द्र देवकोटा
११. रेजिडेन्ट इन्जिनियर भुवन अर्याल
१२. ,, शिव अधिकारी









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२३६ गीता ब. पन्त - बनेपा ६
२३७ योगनाथ सत्याल पाँचखाल-६ सत्यालबेसी
२३८ रामशरण रेग्मी - पाँचखाल-८ पलाञ्चोक भगवती
२३९ रामकृष्ण कोइराला " ८ शिवपुर
२४० उत्तम काफ्ले " "
२४१ जगन्नाथ न्यौपाने
२४२ अर्जुन तिमल्सिना हस्ते
२४३ बद्री प्र० आचार्य
२४४ सन्तोष रिजाल वडा नं ३
२४५ विकल बहादुर हुमागाई " ५

प्रस्तावहरु :-
१) यस पुनर्कोशी पाँचखाल नगर खानेपानी आयोजनाको विस्तृत डिजाईन प्रतिवेदन प्रस्तुत सम्बन्धमा ।
२) आयोजनालाई आवश्यक पर्ने जग्गाको सम्बन्धमा ।
३) आयोजना निर्माण गर्दा हुने वातावरण सम्बन्धी प्रभाव मूल्याङ्कन र अध्ययन सम्बन्धमा ।
४) उपभोक्ताहरु बाट ५% अग्रीम रकम उठाउने सम्बन्धमा ।
५) अन्तिम प्रतिवेदन तयार सम्बन्धमा ।

निर्णयहरु :-
प्रस्ताव नं १ माथी छलफल गर्दा यस नगर आयोजना जुन ADB को सहयोग नेपाल सरकारको अनुदान सहयोगमा सञ्चालन हुने सहरी खानेपानी आयोजनाको डिजाईन कन्सल्टेन्ट TAEC-ICON JV ले गरेको विस्तृत प्रतिवेदक सबै डिजाईन सामाजिक लगै सामाजिक संरक्षण सबै साथै वातावरण सम्बन्धी गरेको अध्ययन प्रतिवेदन पाँचखाल नगरपालिकाको सभाहलमा डिजाईन कन्सल्टेन्ट ले उपभोक्ता तथा सरोकारवालाहरुको माझमा प्रस्तुत छलफल भाग निर्णय गरियो ।

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प्रस्ताव नं. २ माथी छलफल गर्दा निर्माणकार्य गर्नुपर्ने जति Rut याने प्रशोधन केन्द्र, पाइपलाईन बिस्तार गर्दा आवश्यक पर्ने जग्गा जल उपभोक्ता समितिको नाउँमा स्वामित्व हस्तान्तरण सहित सालबसाले निकास बैंकको सामाजिक (सेफगार्ड) सुरक्षण-नीति अनुसार उपलब्ध गराउनु पर्ने हुन्छ। यस आयोजनालाई आवश्यक जग्गाजमिन को कागजात उपलब्ध गराउने निर्णय गरियो।

प्रस्ताव नं. ३ माथी छलफल गर्दा, यस आयोजनाको निर्माण गर्दा सहीनु पर्ने वा हुन आउने सावधिक वातावरण प्रभाव सम्बन्धमा यति अध्ययन गरिएको जानकारी लागि IEE प्रतिवेदन बनाई अगाडि बढ्ने ढेरामाथी पनि छलफल गरियो र यस आयोजनाका IEE प्रतिवेदन अनुसार वातावरण मा पर्ने प्रभावहरूलाई न्यूनीकरण गर्दै वातावरणमा असर पर्न नदिने वातावरण विकासमा प्रतिवद्ध भई अगाडि बढ्ने निर्णय गरियो।

प्रस्ताव नं. ४ माथी छलफल गर्दा आयोजनाको अवधारणा अनुसार अग्रीम उठाउनु पर्ने ५% रकम स्थानीय स्तरबाट उठाउनु पर्ने हुन्छ। उक्त रकम प्रत्येक घरधुरीबाट संकलनगरी उठाउने ~~निर्णय गरियो~~ र आयोजनालाई आवश्यक कागजात ३ महिना भित्रमा उपलब्ध गराउने समेत निर्णय गरियो।

प्रस्ताव नं. ५ माथी छलफल गर्दा आयोजना कार्यान्वयन कार्यालयमा भएको छलफल र आज भएको छलफल र ०६५/०६६ को दररेट अनुसार अन्तिम प्रतिवेदन तयार गर्ने जानकारी को समेत निर्णय गरियो।

English Translation for the Minutes of Meeting

To implement the proposed Panchkhal Water Supply & Sanitation, large WUSC meeting under the chairmanship of Mr. Kumar Prasad Lamichhane, Chairman of Sunkoshi Panchkhal WUSC in the presence of Honorable Minister of Information & Communications, Respected Mr. Gokul Prasad Baskota as a Chief Guest, is conducted on October 06, 2018 in the presence of the following mentioned participants. Similarly, discussions on the following mentioned agenda and decisions were made accordingly under the consent of all.

S.No.	Name of Participants	Designation/Address
1.	Mr. Kumar Prasad Lamichhane	Chairman, Sunkoshi Panchkhal WUSC
2.	Respected Mr. Gokul Baskota	Minister of Information & Communication (Chief Guest)
3.	Mr. Laxman Lamsal	Provincial Assembly MP from Kavre Area no. Kha
4.	Mr. Mahesh Kharel	Mayor,Panchkhal Municipality
5.	Ms. Manju Gautam (Paudel)	Vice-Coordinator of DCC, Kavre
6.	Ms. Laxmi Danuwar	Deputy Mayor, Panchkhal Municipality
7.	Mr. Rajendra Sapkota	Deputy Project Director, TSTWSSSP
8.	Mr. DhrubaRijal	Chairman, TDF
9.	Mr. Subash Raj Pant	Project Coordinator
10.	Mr. Binod Chandra Devkota	MD, TAEC Consult P. Ltd.
11.	Mr. Srijan Aryal	Design Engineer/MD ICON P. Ltd.
12.	Mr. Shiva Adhikari	Social Expert, TAEC Consult P. Ltd.
13.	Mr. Bhola Prasad Chapagain	Executive Officer, Panchkhal Municipality
14.	Mr. Tej Bahadur Mijar	Former MP
15.	Mr. Janardan Nepal	Former Secretary at Ministry of Home Affairs
16.	Dr. Sudhar Adhikari	Local Advisor
17.	Mr. Narendra Jung Peter	Senior Journalist
18.	Mr. Shuva Adhikari	Local Advisor
19.	Mr. Damodar Adhikari	Local Advisor
20.	Dr. Bharat Lamichhane	Local Advisor
21.	Mr. Arjun Prasad Sapkota	Local Advisor
22.	Mr. Om Prasad Lamichhane	Local Advisor
23.	Ms. Saraswoti Chimoriya	Local Advisor
24.	Mr. Ram Sharan Regmi	Local Advisor
25.	Mr. Kanchan Adhikari	Guest
26.	Mr. Raj Kumar Shrestha	Guest
27.	Mr.Rabindra Sipkhan	Vice Chairman, WUSC
28.	Mr. Chet Prasad Gautam	Secretary, WUSC
29.	Mr. Jhal kumar Dulal	Treasurer, WUSC
30.	Mr. Asta Badhur Tamang	Ward Chairman-1
31.	Mr. Hari Khatiwada	Ward Chairman-2
32.	Mr. Sundar Adhikari	Ward Chairman-3
33.	Mr. Sunder lama	Ward Chairman-4
34.	Mr. Bal Krishna Sapkota	Ward Chairman-5
35.	Mr. Ram Sharan Dulal	Ward Chairman-6
36.	Mr. Puskar Dhakal	Ward Chairman-7
37.	Mr. Sanjay Tamang	Ward Chairman-8
38.	Mr. Kiran Shrestha	Ward Chairman-9
39.	Mr. Narayan Prasad Sapkota	Ward Chairman-10
40.	Mr. Shiva	Ward Chairman-11

S.No.	Name of Participants	Designation/Address
	Sharan Tamang	
41.	Mr. Gopal Danuwar	Ward Chairman-12
42.	Mr. Sukbir Tamang	Ward Chairman-13
43.	Mr. Man Bahadur Gurung	Engineer, TDF
44.	Mr. Maili Danuwar	Member, WUSC
45.	Mr. Bhola Prasad Chapagain	
46.	Mr. Aite Singh Tamang	Ward no 3
47.	Ms. Manju Gautam	Deputy Chief, DCC, Kavre
48.	Ms. Mandira Bisuke	Ward no. 7, Shikharpur
49.	Ms. Sanjita Danuwar	Ward No 4, Tamaghat
50.	Mr. Navaraj Koirala	Ward No 2
51.	Mr. Ram Prasad Panta	Ward No 6
52.	Mr. Binod Prasad Adhikari	Ward No 3
53.	Mr. Thakur Nath Adhikari	Ward No 2
54.	Mr. Shatrughan Danuwar	Ward no 6
55.	Mr. Rajan Karki	Ward no 3
56.	Ms. Pramila Acharya	Kathmandu, Ward no.4
57.	Mr. Buddhi	
58.	Mr. Gopi	
59.	Mr. Ram Prasad Koirala	Ward no 2
60.	Mr. Yagya Prasad Bolakhe	
61.	Mr. Jivan Nath Dahal	
62.	Mr. Padam Prasad Ghorsaini	Ward no 7
63.	Mr. Binod Prasad Bajgain	Ward no 8
64.	Mr. Shree Prasad Sapkota	Ward no.8, Hokse
65.	Mr. Kanchha Raj Giri (Mahat)	Ward no 3
66.	Mr. Shakti Ballav Acharya	Ward no 8
67.	Mr. Purna Bhadra Dhungana	Ward no 8
68.	Ms. Ganga Maya Tamang	Ward no 4
69.	Mr. Dinesh Adhikari	Ward no 3
70.	Mr. Harihar Adhikari	Ward no 3
71.	Ms. Jamuna BK	Ward no 4
72.	Ms. Saraswoti Fainju	Ward no 8
73.	Ms. Durga Humagain	Ward no 10
74.	Mr. Dilip Acharya	Ward no 12
75.	Mr. Yagya Bahadur Darji	Ward no 6
76.	Mr. Hari Bahadur Danuwar	Ward no 12
77.	Mr. Madan Prasad Sapkota	Ward no 2
78.	Mr. Achuttam Khatiwada	Ward no 3
79.	Ms. Nol Kumari Adhikari	Ward no 4
80.	Mr. Yadav Prasad Dangal	Ward no 6
81.	Mr. Purshottam Ghimire	Hokse Health Post
82.	Mr. Hari Prasad Panta	Ward no 6
83.	Mr. Tika Bahadur (Aatma Ram) Baniya	Ward no 6
84.	Mr. Hari Ram Sapkota	Ward no 2
85.	Mr. Narayan Dhakal	Ward no 2
86.	Mr. Prakash Baniya	Ward no 3
87.	Mr. Surya Bhadur Bhetwal	Ward no 9
88.	Mr. Prakash Dulal	Ward no 6
89.	Mr. Keshav Prasad Bolakhe	Ward no 4
90.	Mr. Subash Luintel	Ward no 3
91.	Mr. Ganesh Prasad Timilsina	Ward no 2
92.	Mr. Yuvraj Aryal	Ward no 3
93.	Mr. Siddha Prasad Poudyal	Ward no 6
94.	Mr. Tika Prasad Bolakhe	Ward no 7

S.No.	Name of Participants	Designation/Address
	(Luitel)	
95.	Mr. Navraj Bolakhe (Chhettri) Luintel	Ward no 7
96.	Mr. Khadga Prasad Kafle	Ward no 7
97.	Mr. Lal Chandra Timilsina	Ward no 3
98.	Mr. Nanda Prasad Dulal	Ward no 6
99.	Mr. Shanker Nepal	Ward no 3
100.	Mr. Pramod Chaulagain	Ward no 4
101.	Mr. Balram Poudel	Ward no 6
102.	Mr. Shyam Bahadur Bishwokarma	Ward no 9
103.	Mr. Prem Raj Bhetwal	Ward no 9
104.	Mr. Shyam Kumar Danuwar	Ward no 6
105.	Mr. Kul Raj Shrestha	Ward no 9
106.	Mr. Dev Raj Bolakhe	Ward no 7
107.	Ms. Sabitri BK	Ward no 6
108.	Ms. Anita BK	Ward no 6
109.	Ms. Bhagat Bahadur Lama	Ward no 6, Lamidanda
110.	Mr. Nir Bahadur Lama	Ward no 4
111.	Mr. Nom Prasad Adhikari	Ward no 7
112.	Mr. Harsha Lal Shrestha	Ward no 4
113.	Mr. Nanda Prasad Lamichhane	Ward no 3
114.	Mr. Madan Luintel	Ward no 3
115.	Mr. Buddhi Lal Shrestha	Ward no 6
116.	Mr. Manoj BK	Ward no 6
117.	Mr. Rajkumar Sapkota	Ward no 5
118.	Mr. Ram Prasad Sapkota	Ward no 2
119.	Mr. Roshan Kafle	Ward no 7
120.	Ms. Prayusa timilsina	Ward no 7
121.	Mr. Prakash Timilsina	Ward no 3
122.	Ms. Ayusha Timilsina	Ward no 3
123.	Mr. Badri Prasad Sapkota	Ward no 2
124.	Mr. Dhalak Prasad Gautam	
125.	Mr. Ganga Prasad Adhikari	
126.	Mr. Raju Prasad Bolakhe	
127.	Mr. Navaraj Bajgain	Ward no. 8
128.	Mr. Kalu Parajuli	Ward no 6
129.	Ms. Laxman Sapkota	Ward no 6
130.	Mr. Gokul Guragain	Ward no 6
131.	Mr. Ganga Ram Adhikari	Ward no 2
132.	Mr. Arjun Dahal	Ward no 3
133.	Mr. Kedar Nath Sapkota	Ward no. 2
134.	Mr. Keshav Raj Kafle	Ward no 7
135.	Mr. Ganga Bahadur Panta	Ward no 6
136.	Mr. Yog Nath Satyal	Ward no 6
137.	Mr. Ram Sharan Regmi	Ward no 9
138.	Mr. Ram Krishna Bolakhe	Ward no 7
139.	Mr. Uttam Kafle	Ward no 7
140.	Mr. Jaggannath Khanal	
141.	Mr. Arjun Timilsina	
142.	Mr. Badri Prasad Acharya	
143.	Mr. Santosh Sipkhan	Ward no 3
144.	Mr. Khil Bahadur Luitel	Ward no 5

Agendas:

1. Regarding the detailed engineering design report of the proposed Panchkhal Water Supply & Sanitation project
2. Regarding the land required for the proposed project
3. Regarding the evaluation and study on the likely environmental effects resulting from the construction of the proposed project.
4. Regarding the collection of 5% upfront cash collection from the beneficiaries
5. Regarding the preparation of Final Updated Design Report

Decisions:

The following decisions were made concerning the above-mentioned agendas:

1. As per agenda no. 1, the information on the details of the technical survey, socio-economic survey as well as study related to the environmental aspects of the proposed project carried out by the design consultant, TAEC-ICON JV P. Ltd. has been delivered to the beneficiaries/stakeholders and the relevant discussions were made accordingly.
2. As per agenda no. 2; the ownership of the land required for the construction of water treatment plant, reservoir tanks and for pipe laying works should be handed over by WUSC and the required land should be provided as per ADB Safeguard Policy. Accordingly, the decision to provide the relevant necessary documents of the required land for the proposed project has been made.
3. As per agenda no. 3; discussions were done regarding the IEE report preparation for which the study on the likely environmental impacts resulting from the construction of the proposed project has already been carried out. And, the decision has been made to avoid the likely environmental impacts as mentioned in IEE report through strong commitment & concern towards the environmental aspects of the proposed project.
4. As per agenda no. 4; 5% of upfront cash contribution shall be collected at local level. The decision to collect this upfront cash from each household and to provide necessary documents within 3 months has been made.
5. As per agenda no. 5, the decision has been made to prepare Final Updated Detailed Engineering Design Report as per discussions made at PMO, todays' discussion and as per FY 075/076 Kavre District Rate.

Public Consultations

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Suppy and Sanitation Project
Venue: Panchkhal, Kavre
Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
१	बालकृष्ण पराजुली		[illegible]
२	बद्रि प्रसाद पराजुली		[illegible]
३.	रमा दाहाल (9841107600)	उपसभापति KTV	[illegible]
४	कल्पना काफ्ले		[illegible]
५	रामनाथ घिमाल		[illegible]
६.	भक्त प्र० ह्योंपाने		[illegible]
७.	रामबहादुर प्र० जयसवाल	प्र.अ. उन्नत मा.वि.	[illegible]
८	SANTOSH SAPKOTA		[illegible]
९.	रिता देवी [illegible]		[illegible]
१०.	सरोज घिमिरे	—	[illegible]
११	शिवहरि पराजुली	वडा सदस्य	[illegible]
१२	सीता पौडेल		[illegible]
१३	कैम बहादुर श्रेष्ठ		[illegible]
१४	बालकृष्ण घोरसाइने	जि.जन - दुग्ध सह.	[illegible]
१५	राजु लुईटेल	इन्जिनियर, [illegible]	[illegible]
१६	सीता बानियाँ	४ वडा से.	[illegible]
१७	चन्द्र मणि [illegible]	टेक्निसियन [illegible]	[illegible]
१८	घले मिजार	कुम्भेश्वर	[illegible]
१९	कुमार सिंह विश्वकर्मा	रयाले-५	[illegible]
20	रविन्द्र कुमार काफ्ले	पाँचखाल-6	[illegible]
२१.	निर्मल श्रेष्ठ	पाँचखाल ६	[illegible]
२२	सीताराम अधिकारी	पाँचखाल ३	[illegible]

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Suppy and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
२३	तेज प्रकाश मिश्र	पाँचखाल २	
२४	शिव गोपाल श्रेष्ठ	पाँचखाल	
२५	लालबिर मिजार	- 6	
२६	सन्देश कायस्थ	पाँचखाल ६	
26	शरद बहादुर श्रेष्ठ	" - 6	
२८	रुद्रचन्द्र जोशी	पाँचखाल - ११	
२९	राजेश खत्री	" "	
30	रत्न मान लामा तामाङ	" "	
३१	राजाराम मिश्र	" २	
३२	ज्ञान ब. राई	" ४	
३३	पदम बि. क.	" ६	
३४	अर्जुन वाग्ले	पाँचखाल ३	
३५	रामशरण दाहाल	पाँचखाल - २	
३६	राम शरण श्रेष्ठ	पाँचखाल - ४	
३6	किशोर प्र. कुइँकेल	पाँचखाल ६	
३८	भिम बा. कुइँकेल	पाँचखाल ६	
३९	पुण्य प्रसाद पोखरेल	पाँचखाल २	
४0	राज कु. श्रेष्ठ	पाँचखाल ६	
४१	बिजली प्र. न्यौपाने	पाँचखाल 6	
४२	कुमार राज गिरी	पाँचखाल ३	
४३	दिपेन्द्र गिरी	" "	
४४	प्रकाश सापकोटा	" "	

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Suppy and Sanitation Project

Venue: Panchkhal, Kavre

Attendance: Date: 6 oct, 2018

S.N.	Name	Designation	Signature
४६	[illegible]	[illegible]	[illegible]
४७	[illegible]		[illegible]
४८	[illegible]	[illegible]	[illegible]
४९	[illegible]	[illegible]	[illegible]
५०	[illegible]	[illegible]	[illegible]
५१	[illegible]	[illegible]	[illegible]
५२	[illegible]	[illegible]	[illegible]
५३	[illegible]	[illegible]	[illegible]
५४	[illegible]	[illegible]	[illegible]
५५	[illegible]	[illegible]	[illegible]
५६	[illegible]	[illegible]	[illegible]
५७	[illegible]	[illegible]	[illegible]
५८	[illegible]	[illegible]	[illegible]

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Suppy and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
१	भिम प्र. अधिकारी	पाँचखाल-२	
२	NARA HARI SHAH	" १२	
३	रामचन्द्र नेपाल	पाँचखाल-२	
४	विनाम पौडेल	" "	प्रेम
५	केदार नाथ दाहाल	"	केदार
६	भिम प्रसाद काफ्ले	"	
७	सुदर्शन आचार्य	पाँचखाल -११	
८	शिव प्रसाद खतिवडा	पाँचखाल २	
९	दिनेश प्र. खतिवडा	पाँचखाल -८	
१०	दिपक प्र. काफ्ले	पाँचखाल ६	
११	सन्त मान तामाङ	" ९	
१२	मिन बहादुर तामाङ	" २	मिन
१३	पदम ब. पौडेल	६	
१४	निरन्जन सापकोटा	" २	
१५	बद्री प्रसाद दाहाल	२	बद्री
१६	रामन अधिकारी	" ६	रामन
१७	मुकुन्द प्र. कोइराला	२	मुकुन्द
१८	दिलीप गिरी	४	दिलीप
१९	मुकुन्द नाथ सापकोटा	२	मुकुन्दनाथ
२०	नारायण प्रसाद काफ्ले	६	
२१	दिल्ली राज काफ्ले	६	
२२	विश्वराम सापकोटा	पाँचखाल-२	

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Suppy and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
२३	खिल ब. काइटेल	पाँचखाल - ५	शील
२४	अर्जुन श्राहाल	पाँचखाल - २	[illegible]
२५	सानोबाबु हुवाद	पाँचखाल - ४	सानु बाबु
२६	रामप्रसाद पाँडेल	" २	[illegible]
२७	बलराम भुजेल	२	बलराम
२८	देवराज बस्नात	" १०	[illegible]
२९	विष्णु बा. मिजार (सागर)	पाँचखाल - १०	[illegible]
३१	पदम ब. मिजार	" १	पदम
३२	धुर्ब ब नगरकोटी	" ३	धुब
३३	गिताललाल श्रेष्ठ	" ६	[illegible]
34	Deepak Bika	" 6	[illegible]
३५	सुशिल अधिकारी	" ३	[illegible]
३६	चमेली कामी	" ९	चमेली
36	कलि भारती	" ६	काली
३८	कबिता गिरी	" ६	कबिता
३९	उमा श्रेष्ठ	" ८	उमा
४०	बिष्णु श्रेष्ठ	" ८	बिष्णु श्रेष्ठ
४१	रेश्मा श्रेष्ठ	८	रेश्मा
४२	गमा	८	गमा
४३	बिमला	४	बिमला

ANNEX I:
Chlorine Use Guidelines

GUIDELINE VALUE

In humans and animals exposed to chlorine in drinking-water, specific adverse treatment related effects have not been observed.

Chlorine in drinking water is safe for consumption .The small amount of chlorine typically used to disinfect water does not pose risks to human health. The World Health Organization (WHO) has established a guideline value of 5 mg/L for chlorine in drinking water, meaning that such concentrations are considered acceptable for lifelong human consumption. Furthermore, WHO concludes that this value is "conservative," as no adverse effects from chlorine in drinking water were observed in studies reviewed by WHO.

Guideline values for chlorine WHO Guidelines for drinking water quality (2004)

Chlorine	**below 5 milligrams per liter (mg/L)***

*For effective disinfection, there should be a residual concentration of free chlorine of 0.5 mg/L after at least 30 min contact time at pH<8.0

Chlorination does not harm aquatic environments

Chlorinated drinking water is unlikely to be harmful when discharged into aquatic environments. An extensive risk assessment conducted under European Union guidelines examined potential harm from various processes to make drinking water using sodium hypochlorite. This assessment found no significant environmental risks from chlorine or byproducts formed during drinking water chlorination. The DBPs formed in drinking water depend on the nature and quantity of organic matter present as well as on the disinfectant and other treatments used. In drinking water the principal byproducts are trihalomethanes (THMs; mainly chloroform) and haloacetic acids (HAAs), with smaller amounts of other byproducts. Direct 'whole effluent' experiments representing various uses, including drinking water, have shown that no significant amounts of persistent and potentially bioaccumulative substances are formed. Toxicity tests on these mixtures demonstrated that the presence of DBPs did not increase the toxicity.

A major concern from the past was the formation of some highly-chlorinated, high-hazard molecules, such as dioxins, resulting from chlorine used in paper pulp bleaching. However, dioxins were only formed from 'active chlorine' under specific conditions: acid pH and in the presence of certain phenols such as those abundant in the lignin component of wood. There is no significant formation of dioxins or other high-hazard molecules at neutral or alkaline pH. All current uses of 'active chlorine' for microbial control and cleaning take place at alkaline or neutral pH.

Annex J
Water Quality Test Reports

NS Lab Accreditation No.: 09-2068/69 Regd. No. 53875/064/065

AASTHA SCIENTIFIC RESEARCH SERVICE PVT. LTD.

P.O. Box No. 4316, Dillibazar, Kathmandu, Nepal
Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com

(Center for complete scientific solution)

Test Report/Certificate

Report No. : 728/2074
Entry No. : AASTHA – 550– 2074
Sample : Water
Client : TAEC-ICON JV
Source : Thumka (Tanki)

Date received : 03 – 10 – 2074
Date completed : 11 – 10 – 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H+ APHA-AWWA-WEF 2012, 22nd Edition	8.0	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	443	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	2.3	5 (10), max.
4.	Taste and Odor	-	N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.05	5(15), max.
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	228	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22nd Edition	309	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	7.43	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	<0.05	1.5, max.
11.	Nitrate, (mg/l)	4500-NO_3- B, APHA-AWWA-WEF 2012, 22nd Edition	8.04	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	<0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22nd Edition	0.19	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	6.32	250, max.
15.	Mercury*, (mg/l)	3500-Hg C, APHA AWWA WEF, WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22nd Edition	75.2	200, max.
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	<0.05	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)		<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.02	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05, max.

Remarks: *Water quality meets NDWQS specified limit.*

Analyzed By Checked By Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
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4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.

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Test Report/Certificate

Report No. : 729/2074
Entry No. : AASTHA – 550– 2074
Sample : Water
Client : TAEC-ICON JV
Source : Lamdi (Tanki)

Date received : 03 – 10 – 2074
Date completed : 11 – 10 – 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H+ APHA-AWWA-WEF 2012, 22nd Edition	7.8	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	261	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	1.2	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.13	5(15), max.
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	96	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22nd Edition	179	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	13.01	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.16	1.5, max.
11.	Nitrate, (mg/l)	4500-NO3- B, APHA-AWWA-WEF 2012, 22nd Edition	2.55	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	0.12	0.20, max.
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	5.48	250, max.
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF , WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA AWWA WEF 2012, 22nd Edition	30.4	200, max.
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	0.11	0.3(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)		<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.02	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05, max.

Remarks: *Water quality meets NDWQS specified limit.*

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Test Report/Certificate

Report No. : 731/2074
Entry No. : AASTHA – 550– 2074
Sample : Water
Client : TAEC-ICON JV
Source : Sunkoshi River

Date received : 03 – 10 – 2074
Date completed : 11 – 10 – 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H⁺ APHA-AWWA-WEF 2012, 22nd Edition	8.10	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	106	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	20.8	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.26	5(15), max.
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	64	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22nd Edition	77	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl⁻ B, APHA-AWWA-WEF 2012, 22nd Edition	1.85	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.16	1.5, max.
11.	Nitrate, (mg/l)	4500-NO_3 B, APHA-AWWA-WEF 2012, 22nd Edition	0.49	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F⁻ D, APHA - AWWA - WEF 2012, 22nd Edition	0.08	0.2-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	11.24	250, max.
15.	Mercury*, (mg/l)	3500-Hg C, APHA-AWWA-WEF , WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500 Ca B, APHA-AWWA-WEF 2012, 22nd Edition	17.6	200, max.
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	0.79	0.3(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20	Cadmium*, (mg/l)		<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		<0.01	3.0, max.
24.	Arsenic, (mg/l)	3500 As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05, max.

Remarks: *Observed values of turbidity and iron do not meet NDWQS specified limit.*

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Test Report/Certificate

Report No. : 730/2074
Report No. : 728/2074
Entry No. : AASTHA – 550– 2074
Sample : Water
Client : TAEC-ICON JV
Source : Palanchowk Thokre Khola

Date received : 03 – 10 – 2074
Date completed : 11 – 10 – 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H⁺ APHA-AWWA-WEF 2012, 22nd Edition	8.3	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	419	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	2.9	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.09	5(15), max.
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	204	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22nd Edition	289	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	3.72	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.07	1.5, max.
11.	Nitrate, (mg/l)	4500-NO_3- B, APHA-AWWA-WEF 2012, 22nd Edition	0.50	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	<0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F⁻ D, APHA - AWWA - WEF 2012, 22nd Edition	0.31	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	6.10	250, max.
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF, WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22nd Edition	51.2	200, max.
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	0.10	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)		<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.12	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05, max.

Remarks: *Water quality meets NDWQS specified limit.*

Analyzed By Checked By Authorized By

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Nepal Environmental & Scientific Services (P) Ltd.
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http://www.nesspltd.com

NESS/Lab, M-03/R1.1

QS Test Report / Certificate

NS Accreditation No. Pra. 01/053-54

Entry No. : NCL - 71 (W) (I) - 08 - 2018
Sample : Sunkoshi River Water
Client : TAEC/ICON JV
Sampled By : Client
Project : Sunkoshi Panchkhal Town Project

Date Received : 09 - 08 - 2018
Date Completed : 21 - 08 - 2018
Sampling Date : 08 - 08 - 2018
Location : Sunkoshi River

S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 23°C	Electrometric, 4500 - H^+ B,. APHA	7.5	5.5 - 9
2.	Turbidity, (NTU)	Nephelometric, 2130 B, APHA	110	-
3.	Color, (Chromacity Unit)	Spectrophotometric, 2120 C, APHA	0.67	-
4.	Total Hardness as $CaCO_3$, (mg/L)	EDTA Titrimetric, 2340 C, APHA	40	-
5.	Calcium, (mg/L)	EDTA Titrimetric, 3500 - Ca B & 3500 - Mg B APHA	12.02	-
6.	Total Dissolved Solids, (mg/L)	Oven Drying Method, 180°C, 2540 C, APHA	88	-
7.	Sulphate, (mg/L)	Gravimetric Method with Ignition of Residue, 4500 – SO_4^{2-} C, APHA	4.95	-
8.	Chloride, (mg/L)	Argentometric Titration, 4500 – Cl B, APHA	1.49	-
9.	Ammonia, (mg/L)	Direct Nesslerization, 4500 – NH_3 C APHA	0.14	-
10.	Nitrate, (mg/L)	UV Spectrophotometric Screening, 4500 – NO_3^- B, APHA	2.66	-
11.	Aluminum, (mg/L)	Erichrome Cyanine R, 3500 - Al A: APHA	0.02	-
12.	Fluoride, (mg/L)	SPANDS, 4500 – F D, APHA	<0.05	2, *max*
13.	Iron, (mg/L)		2.38	-
14.	Manganese, (mg/L)		0.06	-
15.	Cadmium, (mg/L)	Direct Air – Acetylene AAS, 3111 B, APHA	N. D. (<0.003)	2, *max*
16.	Lead, (mg/L)		N. D. (<0.01)	0.1, *max*
17.	Copper, (mg/L)		<0.01	3, *max*
18.	Zinc, (mg/L)		0.04	5, *max*
19.	Arsenic, (mg/L)	SDDC,. 3114 B: APHA	N. D. (<0.01)	0.2, *max*
20.	Mercury, (mg/L)	Cold Vapor AAS, 3112 B: APHA	N. D. (<0.0005)	0.01, *max*

N. D.: Not Detected

Note: The gravimetric analysis was carried out in controlled temperature condition (20°C).
APHA: American Public Health Association; AAS: Atomic Absorption Spectrophotometer; EDTA: Ethylenediaminetetraacetic acid; NTU: Nephelometric turbidity unit; UV: Ultraviolet.

Remarks: ***All observed values complied the prescribed effluent standards discharged into inland surface water.***

(Analyzed By) (Checked By) (Authorized Signature)

Note:
1. This report/certificate is in reference to Laboratory Quality Control Manual, QS (018), section OPT.
2. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied.
3. Liability of our institute is limited to the invoiced test parameters & amount only.
4. Samples will be destroyed after one month from the date of issue of test certificate unless otherwise specified.
5. This report should not be reproduced wholly / partially for any advertizing media without our permission.
6. The clients are requested to take back their hazardous samples along with the report/certificate.

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http://www.nessptld.com

NESS/Lab, M-03/R1.1

QS Test Report / Certificate

NS Accreditation No. Pra. 01/053-54

Entry No. : NCL - 739(W) (I) - 06 - 2019
Sample : River Water (Sunkoshi)
Client : TAEC/ICON JV
Sampled By : Client

Date Received : 30 - 06 - 2019
Date Completed : 11 - 07 - 2019
Sampling Date : 28 - 06 - 2019
Location : Sunkoshi River Panchkhal W.S.P

S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 25°C	Electrometric, 4500 - H^+ B.: APHA	7.5	5.5 - 9
2.	Turbidity, (NTU)	Nephelometric, 2130 B, APHA	125	-
3.	Color, (Chromacity Unit)	Spectrophotometric, 2120 C, APHA	0.13	-
4.	Total Hardness as $CaCO_3$, (mg/L)	EDTA Titrimetric, 2340 C, APHA	2.8	-
5.	Calcium, (mg/L)	EDTA Titrimetric, 3500 - Ca B & 3500 - Mg B APHA	18.44	-
6.	Total Dissolved Solids, (mg/L)	Oven Drying Method, 180°C, 2540 C, APHA	78	-
7.	Sulphate, (mg/L)	Gravimetric Method with Ignition of Residue, 4500 – SO_4^{2-} C, APHA	0.82	-
8.	*Residual Chlorine, (mg/L)	Iodometric Titration, 4500- Cl B: APHA	Nil	-
9.	Chloride, (mg/L)	Argentometric Titration, 4500 – Cl^- B, APHA	2.97	-
10.	Ammonia, (mg/L)	Direct Nesslerization, 4500 – NH_3 C APHA	0.04	-
11.	Nitrate, (mg/L)	UV Spectrophotometric Screening, 4500 – NO_3^- B, APHA	0.98	-
12.	Aluminium, (mg/L)	Erichrome Cyanine R, 3500 - Al A: APHA	0.04	-
13.	Fluoride, (mg/L)	SPANDS, 4500 – F D, APHA	<0.05	2, *max*
14.	Iron, (mg/L)	Direct Air – Acetylene AAS, 3111 B, APHA	3.42	-
15.	Manganese, (mg/L)		0.23	-
16.	Cadmium, (mg/L)		0.004	2, *max*
17.	Lead, (mg/L)		0.05	0.1, *max*
18.	Copper, (mg/L)		0.12	3, *max*
19.	Zinc, (mg/L)		0.11	5, *max*
20.	Arsenic, (mg/L)	SDDC., 3114 B: APHA	N. D. (<0.01)	0.2, *max*
21.	Mercury, (mg/L)	Cold Vapor AAS, 3112 B: APHA	N. D. (<0.0005)	0.01, *max*

*: Non-accredited Parameter

N. D.: Not Detected

Note: The gravimetric analysis was carried out in controlled temperature condition (20°C).
APHA: American Public Health Association; AAS: Atomic Absorption Spectrophotometer; EDTA: Ethylenediaminetetraacetic acid; NTU: Nephelometric turbidity unit; UV: Ultraviolet.

Remarks: ***All observed values complied the prescribed effluent standards discharged into inland surface water.***

(Analyzed By) (Checked By) (Authorized Signature)

Note:
1. This report/certificate is in reference to Laboratory Quality Control Manual, QS (018), section OPT.
2. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied.
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Annex K
Photographs

1. Proposed Intake Site Visit during Inspection

2. Proposed Intake/Sump Well Site

3. Proposed Sump well Site from left bank

4. Site Visit by PMO & Consultant

5. Existing RVT

7.Proposed WTP Site

8. Proposed RVT 5 Site (Radhakrishna School)

9. Proposed RVT 7 Site at (Jaretar)

10. Proposed RVT 8 site (Shikharpur)

11. Proposed RVT 9 site

12. Proposed RVT 11 site (Kharelthok)

13. Meeting during Inspection Visit

14. Meeting with the beneficiaries during field survey

15. Draft Detailed Engineering Design Report (DEDR) Presentation at Panchkhal

16. People Participation During Draft DEDR Presentation

17. People Participation During Draft DEDR Presentation

18. View of Panchkhal Valley

SAUW IEE Review - Information Log

Instructions: Provide information based on IEE submitted by Project Management Office (PMO). This IEE log sheet will serve as record of the review findings, comments, and/or further actions required during implementation. A copy of the IEE log sheet should be (i) provided to PMO for their record and guidance on actions during implementation; (ii) attached in the cleared IEE to be disclosed; (iii) used as reference for review of updated/final IEE and (iv) inputted in the SARD Safeguards Compliance Tracking System.

Project:	**Nepal: Urban Water Supply and Sanitation Project (UWSSP): Panchkhal Water Supply and Sanitation Subproject**		
Loan No.:	3711	**Package No.:**	**W14**

Components:

Items	**Description**
Proposed intakes	1 set (2 sump well/ intakes with 4 collectors) at Sunkoshi river right bank (WN - 10 of Bhumlu Rural Municipality)
Water treatment plant	Rapid mixture followed by flocculator followed by sedimentation tank followed by rapid sand filter then disinfection. Total Capacity for 84 lps, at WTP location beside transformer about 200m downstream of Bhimsenthan.
Pumping Details	All pumps run at a time: Stage 1/ Sumpwell: 4 nos-85HP, Transformer 500KVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 2: 4 nos. 85HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 3: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 4: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 9 of Panchkhal Municipality Stage 5 (WTP site): 2no each 20HP (only one run at a time) for RVT-10 and 2 no each 5HP (only one run at a time) for backwash cum Kharelthok (RVT-11) supply-WN 9 of Panchkhal Municipality
Ground Reservoir (No and Capacity in CUM)	**From Sump Well to WTP site:** • 1No-150m^3 at each 2nd,3rd & 4th stage of pumping; • 1no @400 m^3 at WTP site • Location: WN 10 of Bhumlu Rural Municipality from Stage 1 to 3 and WN 9 of Panchkhal Municipality for Stage 4 & WTP Site **Service Reservoir** RVT 1: 150 m^3 capacity (WN-3 of Panchkhal Municipality, Thumka Upstream) RVT 2: 150 m^3 capacity (WN-2 of Panchkhal Municipality, Anekot) RVT 3: 150 m^3 capacity (WN-5 of Panchkhal Municipality, Sashastra) RVT 4: 150 m^3 capacity (WN-6 of Panchkhal Municipality, Bakhreldihi) RVT 5: 100 m^3 capacity (WN-12 of Panchkhal Municipality, Radhakrishna School) RVT 6: 100 m^3 capacity (WN-12 of Panchkhal Municipality, Nayagaun) RVT 7: 150 m^3 capacity (WN-10 of Panchkhal Municipality, Jaretar) RVT 8: 150 m^3 capacity (WN-7 of Panchkhal Municipality, Shikharpur) RVT 9: 50 m^3 capacity (WN-9 of Panchkhal Municipality, Bhetwalthok-9N-29) RVT 10: 100 m^3 capacity (WN-9 of Panchkhal Municipality, Palanchowk Bhagwati) RVT 11: 50 m^3 capacity (WN-9 of Panchkhal Municipality, Kharelthok) **Backwash RVT** RVT 12: 150 m^3 capacity (WN-9 of Panchkhal Municipality, (Tapaldanda) **Total storage capacity: 2,300 m^3**
Pumping Chamber/Sump for pumping	3 Compartments at Stage 2 & 3-WN 10 of Bhumlu Rural Municipality 3 Compartments at Stage 4-WN 9 of Panchkhal Municipality 2 Compartments at Stage 5 (WTP Site)-WN 9 of Panchkhal Municipality
Valve Chamber (Bricks/ RCC)	36 Nos
Pipe valve box	179 Nos
IC/BPT	6 nos (1 at branch transmission of 50cum, 10cum each at RVT-9 distribution system (1no), RVT-10 distribution system (2nos) and t Kharelthowk distribution system (2nos).
Office Cum GH (O1) /Guard House (G 1) / Small Guard	**At Sump Well (1st stage site):** Small Guardhouse G1-1no; Generator house (140kvA) -1no; Boundary wall **Stage 2,3 & 4 sites**: Small Guardhouse G1 -3nos; Generator house (140 kVA) -3nos; Boundary wall

	House (G2) /Dosing House (DS), Generator House, Boundary wall	**At WTP Site (5th stage site):** Medium Guard house G2- 1no; Generator house (50kvA)-1no; Dosing Pump House-1no; Boundary wall & Retaining Wall **At Backwash Reservoir Site**: Small Guardhouse G1 – 1no; Boundary wall **At service reservoir site**: Small Guardhouse G1 – 11nos; Boundary wall **Within Service Area (Panchkhal Bazaar Area)**: Office building O1-1no; Boundary Wall
	Fire Hydrant (m)	20
	River crossing (Nos)	12
	Length of Main Transmission	9,135 m
	Length of Branch Transmission Main (from WTP/ storage to RVT 1 to RVT 9 (Gravity), Backwash RVT (Pumping) (Filter Backwash and to supply water to Kharelthok RVT-11 by gravity), RVT-10 (Pumping)	37,237 m
	Length of Distribution Mains	189,309 m
	Number of DMAs	11 Nos
	Number of HH connection	5,998
	Number of connections for institution	39
Contract Type:	Civil Works	
Date of IEE:	September 2019	

Draft IEE?	Updated/Revised IEE?	Others
		The IEE is the final IEE and components are based on final detailed engineering design.

	Activity	Status		Detailed Comments and Further Actions Required
1.	Environmental assessment has been satisfactorily conducted based on ADB REA Checklist and scoping checklist.[1]	**Yes**	**No**	Previous comment is now addressed in the IEE report. Assessment on the river flow of the Sunkoshi river is presented using secondary data. The withdrawal by the project of 84 lps is negligible compared to river flow of 126,000 lps. "Sunkoshi River has 90% reliable flow of 126 m^3/s (126 x 10^3 lps). The detailed design has proposed to use seepage water from the infiltration gallery that is proposed to be constructed at the sump well site. This seepage water will be drawn at the tapped discharge of
		X		

[1] ADB Rapid Environmental Assessment Checklist for screening and categorization. Scoping Checklist ("No Mitigation Scenario" Checklist) for scope of IEE, identification of impacts and development of environmental management plan.

	Activity	Status		Detailed Comments and Further Actions Required
				84 lps which in actual, is very negligible amount of water in comparison to the discharge of the Sunkoshi River."
2.	Environmental assessment based on latest project components and design	**Yes**	**No**	
		X		
3.	Statutory Requirements[2]		Forest Clearance	The IEE report explicitly states no trees will be cut. However, for any unanticipated cutting of trees during the implementation phase, ensure that PMO/RPMO obtain appropriate clearance (forest clearance or tree cutting clearance). No civil works will commence unless forest clearance or tree cutting clearance, if required, is obtained. PMO to report status in the SEMR.
			No Objection Certificate	To be obtained by PMO/RPMO if needed. No civil works will commence unless NOC, if required, is obtained. PMO to report status in the SEMR.
			Site Location Clearance	To be obtained by PMO/RPMO if needed. No civil works will commence unless site location clearance, if required, is obtained. PMO to report status in the SEMR.
			Environmental Compliance Certificate	PMO is currently in the process of obtaining MOWS-approved IEE. PMO to attach copy of approval document in the SEMR.
			Permit to Construct (or equivalent)	To be obtained by PMO/RPMO if needed. No civil works will commence unless permit to construct (or equivalent), if required, is obtained. PMO to report status in the SEMR.
			Permit to Operate (or equivalent)	To be obtained by PMO/RPMO if needed. No civil works will commence unless permit to operate (or equivalent), if required, is obtained. PMO to report status in the SEMR.
			Others	
5.	Policy, legal, and administrative framework	**Adequate**	**Not Adequate**	Section II discusses the policy, legal and administrative framework of the subproject.
		X		
		Included discussions and requirements of the:		
		Yes	National regulation/law on EIA	
		Yes	Environmental agency	
		Yes	Relevant international environmental agreements	
		Yes	Environmental standards (IFC's EHS Guidelines)	

[2] If applicable, include date accomplished or obtained.

	Activity	Status					Detailed Comments and Further Actions Required
6.	Anticipated environmental impacts and mitigation measures	**assessed impacts and risks:**		**mitigation measures included:**			
				Yes	**No**	**n/a**	
			Biodiversity conservation	X			Protection status of species at the project sites was verified through IUCN Red List and IBAT. All species identified are categorized as Least Concern, except for one mammal (Common Leopard) that is considered Vulnerable. No endangered or critically endangered species was found in the project area. The IEE report mentions that that project will not encroach any forest area. The EMP provides measure that contractor/s will not encroach forest areas, otherwise, the legal provisions of the law including penalties will be imposed.
			Pollution prevention and abatement	X			
			Health and safety	X			Community and occupational health and safety measures are included.
			Physical cultural resources	X			No PCRs identified at the subproject sites.
			Cumulative impacts			X	
			Transboundary impacts			X	
7.	Impacts from Associated Facilities[3]	**Addressed**	**Not Addressed**	**Not applicable**			
				X			
8.	Analysis of Alternatives	**Yes**		**No**			An analysis of alternatives is provided, but this is not required.
		X					
9.	EMP budget included	**Yes**		**No**			Section VIII provides indicative budget of NPR 3,000,000 for EMP implementation.
		X					
10.	EMP implementation integrated in FAM/PAM and bid documents	**Yes**		**No**			(i) Included in PAM during loan processing. (ii) Section IX includes discussion on the inclusion of the EMP in the bid and contract documents. PMO and the RPMO will have the responsibility to ensure compliance with this requirement.
		X					
11.		**Yes**		**No**			

[3] ADB SPS (Appendix 1 para 6) defines associated facilities as not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project.

	Activity	Status		Detailed Comments and Further Actions Required
	Consultation and Participation	X		(i) Section VII discusses the conduct of initial consultation in on 06 October 2018. (ii) Annex H shows a minutes of consultative meeting, with translation in the English language.
12.	Grievance Redress Mechanism	**Yes**	**No**	
		X		
		Description of GRM.		Section VIII discusses the GRM.
		GRC members identified.		Section VIII discusses the GRC membership.
		GRM established and notified?		GRM is established. PMO to confirm in the first SEMR that (i) GRM is notified and GRC members have the capacity to address project-related grievances/complaints, and (ii) contractors are given instructions and orientation on GRM.
13.	Disclosure	To be complied	Endorsement to disclose on ADB website	To be complied after endorsement from PMO is received by ADB.
		To be complied	Disclosed on project website	To be complied by PMO once clearance of the IEE is received from ADB.
		To be complied	Relevant information available to stakeholders and affected people in language and form they understand.	To be complied by PMO once clearance of the IEE is received from ADB.
14.	Mobilized PMO Environment Specialist	**Yes**	**No**	This is confirmed in the SEMR for January – June 2019.
		X		
15.	Mobilized RPMO Environment Specialist	**Yes**	**No**	This is confirmed in the SEMR for January – June 2019.
		X		
16.	Mobilized PMQAC / DRTAC Environment Specialists	**Yes**	**No**	This is confirmed in the SEMR for January – June 2019.
		X		
17.	Mobilized DSMC/RDMSC Environment Specialists	**Yes**	**No**	This is confirmed in the SEMR for January – June 2019.
		X		
18.	Confirm bid and contract documents and/or EMP include requirement for the contractor to appoint EHS supervisor and/or nodal person for environment safeguards	**Yes**	**No**	
		X		Section IX explains this role and responsibility of the contractor. **Next Step:** In the next SEMR, clarify/confirm if the subproject/package will be awarded to more than one contractor, and ensure that each contractor will prepare site-specific EMP (SEMP) that should be reviewed and approved by PMO.
19.	If contract awarded already, confirm contractor's appointment of EHS supervisor and/or	**Yes**	**No**	
		X		Section IX explains contractor has the responsibility to appoint an environment supervisor.

	Activity	Status		Detailed Comments and Further Actions Required
	nodal person for environmental safeguards			
20.	Awareness training on compliance to safeguard requirements	**Yes**	**No**	Section IX discusses the institutional capacity development program, schedule, and topics for the subproject, which PMQAC will supervise.
		X		
21.	Monitoring and Reporting	**Yes**	**No**	
		X		Section X clarifies the monitoring and reporting roles of stakeholders.
22.	**Others/Remarks**	The revised IEE report now includes compliance matrix on the subproject selection criteria in the EARF. Accordingly, these criteria have been complied with under the subproject.		
	Prepared by: *(name, designation and date)*	Miguel B. Diangan, Jr. Safeguards Specialist (Consultant), SAUW 28 October 2019		
	Noted and Checked By: *(name, designation and date)*	Ninette Pajarillaga Environment Specialist, SAUW		
	Documents/References:	1. Previous IEE log sheet 2. Revised Final IEE report of Panchkhal Subproject 3. EARF of UWSSP.		