Updated Initial Environmental Examination

Project number: 35173-013
July 2015

NEP: Third Small Towns Water Supply and Sanitation Sector Project —Kamalamai (Sindhuli District)

Prepared by ITECO Nepal (P) Ltd., SILT Consultants (P) Ltd., and Unique Engineering Consultancy (P) Ltd. for the Government of Nepal and the Asian Development Bank.

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Ministry of Urban Development
Department of Water Supply and Sewerage
Small Towns Water Supply and Sanitation Sector Project (STWSSSP)
Project Management Office (PMO)
Panipokhari, Maharajgunj, Kathmandu, Nepal

Enhance Functionality in Small Towns Water Supply and Sanitation Sector Project (STWSSSP)

UPDATED INITIAL ENVIRONMENTAL EXAMINATION REPORT (IEE)

for

Kamalamai Small Towns Water Supply and Sanitation Sector Project Sindhuli District

Kathmandu, July 2015

Submitted by:

Joint Venture in Between

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Abbreviations

°C	:	Degree Centigrade
ADB	:	Asian Development Bank
CBD	:	Convention of Biological Diversity
CITES	:	Convention on International Trade in Endangered Species of wild Fauna and Flora
cum	:	Cubic Meter
DWSO	:	District Water Supply Office
DWSS	:	Department of water Supply and Sewerage
EA	:	Environmental Assessment
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
EPA	:	Environmental Protection Act
EPR	:	Environment Protection Regulations
HHE	:	Health and Hygiene Education Programs
GON	:	Government of Nepal
HRF	:	Horizontal Roughing Filter
IEE	:	Initial Environmental Examination
JICA	:	Japanese International Cooperation Agency
km	:	Kilometer
KWSSSP	:	Kamalamai Water Supply and Sanitation Sub-Project
LGs	:	Local Governments
lpd	:	Liter per day
lps	:	Liter per second
m	:	Meter
MDG	:	Millennium Development Goals
MOWR	:	Ministry of Water Resources
MPPH	:	Ministry of Physical Planning and Housing
MPPW	:	Ministry of Physical Planning and Works
MoSTE	:	Ministry of Science, Technology and Environment
NGO	:	Non Government Organization
NDWQS	;	National Drinking Water Quality Standard
NPC	:	National Planning Commission
NRs.	:	Nepalese Rupees

O&M	:	Operation and Maintenance
PAC	:	Public Awareness Campaign
PCO	:	Public Call Office
PF	:	Pressure Filter
Pop.	:	Population
PRA	:	Participatory Rural Appraisal
PMO	:	Project Management Office
RRA	:	Rapid Rural Appraisal
SPSO	:	Sub-Project Site Office
SSF	:	Slow Sand Filter
SPS	:	Safeguard Policy Statement
STWSSSP	:	Small Town Water Supply and Sanitation Sector Project
TDF	:	Town Development Fund
VDC	:	Village Development Committee
WHO	:	World Health Organization
WSUC	:	Water Supply Users' Committee
WUSC	:	Water Users and Sanitation Committee

EXECUTIVE SUMMARY

General

The Enhance Functionality in Small Towns Water Supply and Sanitation Sector Project (STWSSSP) will support the government of Nepal (the Government) in improving water supply and sanitation facilities and services to 24 small towns in Nepal. Out of the 265 small towns in Nepal, Asian Development Bank (ADB) has already supported the Government, through successful implementation of earlier two projects in 50 towns. These include the 24 project for enhancement.

The outcome will be inclusive and sustainable water supply and sanitation service delivery in this Kamalamai small town of Nepal. The project will implement improvements/ rehabilitation works within the service area of already completed project. There will be minor civil works necessary for the enhancement of the components without changing the original technical and social concepts.

The Project will be implemented in 9 months period starting around first week of November, 2015.

The project will be funded by a loan using a sector lending approach of ADB. The Executing Agency is the Ministry of Urban Development and the implementing agency is the Department of Water Supply and Sanitation (DWSS).

The sub project IEE report was approved by government of Nepal in 2005. Now the sub project is envisaged to undergo for rehabilitation of project components such as, intake treatment plant, transmission main and distribution line etc. The proposed updated IEE is prepared as an integral part of bid document. However consultant has updated the contents of IEE report already approved from government of Nepal.

This updated IEE Report summarizes anticipated impacts and corresponding mitigation measures, monitoring and also includes cost and time frame for implementation.

In this report, all the policy, legal and administrative framework requirements of ADB including ADB Safeguard Policy and the prevailing GoN Acts/rules & regulations have been considered.

Categorization

Kamalamai town subproject is classified as Environmental Category B as per the SPS as no significant impacts are envisioned. Accordingly this updated Initial Environmental Examination (IEE) has been prepared and assesses the environmental impacts and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

Subproject Scope

The subproject is formulated under the 3STWSSSP to improve water supply and sanitation service delivery in the existing Kamalamai water supply and sanitation project constructed during STWSSP 1. Investments under this subproject includes; (i) rehabilitation of a piped water supply system including intake, water treatment plant, transmission main, and distribution main.

Implementation Arrangements

The Ministry of Urban Development is the executing agency. The Department of Water Supply and Sewerage (DWSS) is the implementing agency. Implementation activities will be overseen by a separate Project Management Office (PMO) which will be established in DWSS head office in Kathmandu and two Regional Project Management Offices (RPMOs) in the eastern and western region. A team of technical, administrative and financial officials, including safeguards specialists, will be provided at the PMO to implement, manage and monitor project implementation activities. The RPMOs will be staffed by qualified and experienced officers and will be responsible for the day-to-day activities of project implementation in the field, and will be under the direct administrative control of the PMO. Consultant teams are responsible for subproject planning and management and assuring technical quality of design and construction; and designing the infrastructure and supervising construction; and safeguards preparation.

Description of the Environment

Subproject components are located in Kamalamai town area and in its immediate surroundings. There is no presence of natural habitat in this project area. The project components will be located in WUSC

sites, public road rights-of-way (ROW) and outside the community managed forest and the protected areas. There are no protected areas, wetlands, mangroves, or estuaries in or near the subproject locations.

Environmental Management

An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv)a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

Locations and sitting of the infrastructures were considered in the existing sub-project to further reduce impacts. The concepts considered in design of the subproject are: (i) demand for new piped water supply; (ii) maximum population coverage with pipe layout mostly in residential areas and areas of high growth rate; (iii) avoidance of water-use conflicts; (iv) locating pipelines within ROWs to reduce acquisition of land; (v) locating pipelines at least 10 meters from latrines, septic tanks and any main drains to avoid contamination; (vi) locating Intake point 30 m upstream from sanitation facilities; (vii) locating household and public latrines and septic tanks at least 30 meters downstream from the nearest drinking water source; (viii) piloting controlled disposal of septage in accordance to WHO and US EPA standards to reduce the likelihood of uncontrolled disposal as currently practiced; and (ix) ensuring all planning and design interventions and decisions were made in consultation with local communities and reflecting inputs from public consultation and disclosure for site selection.

During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of waste soil; and from the disturbance of residents, businesses, and traffic. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during pipe-laying on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

Mitigation Measures

Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB and DWSS websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

The project was implemented to serve ward no. 4, 5, 6, 7 & 9 of Kamalamail Municipality. According to the financial appraisal report of TDF, the project had been designed to serve a total population of 12041 in the base year 2006 and 17,875 in the design year 2020.

The sub-project under construction is a rehabilitation project and the mitigation measures recommended in the approved IEE in 2006 have already been successfully implemented. During the updated IEE preparation process, all of the process mentioned above have been checked and followed. The design report has incorporated the recommended mitigation measures.

During construction phase, there are no major environmental impacts in the enhancement project. However there are minor impacts like landslide and soil erosion, embankment erosion due to diversion of river, landscaping, impact on vegetation, chemical contamination, air and noise pollution during

construction, traffic disturbances and some disturbances in household water supply distribution. In order to minimize the impacts, specific arrangements have been made in the design and incorporated in the specification of work. The contractor is responsible to follow all the instruction given by the DSC and agreed specifications.

During operational phase also, there will be no significant impacts. However there may be minor impact on water right conflict (tap distribution) and occupational health and safety of workers. These issues will be addressed by and will be the responsibility of WUSC.

Consultation, Disclosure and Grievance Redress

Public consultations were done in the preparation of the project and IEE and throughout the project implementation period of the completed project.

During the preparation of this enhancement project and updated IEE, Public consultations were done at different phases. The first consultation was done during survey and design period. Further consultation was made with the stakeholders at project site after the project design report was approved.

The consultation was focused on environmental impacts, resettlement, social issues, relocation and compensation issues.

Monitoring and Reporting

The PMO, RPMO and DSMC will be responsible for environmental monitoring. The RPMO with support from the DSMC will submit monthly monitoring reports to the PMO. The PMO will consolidate the monthly reports and will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

Conclusions and Recommendations

The proposed subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009).

1. INTRODUCTION

1.1 Background

1. The Enhance Functionality in Small Towns Water Supply and Sanitation Sector Project (STWSSSP) will support the government of Nepal (the Government) in improving water supply and sanitation facilities and services to 24small towns in Nepal. Out of the 265 small towns in Nepal, Asian Development Bank (ADB) has already supported the Government, through successful implementation of earlier two projects in 50 towns. These include the 24project for enhancement.

2. The Enhance Functionality in Small Towns Water Supply and Sanitation Sector Project (STWSSSP) will be implemented in 6 months period starting around first week of October, 2015 and will be funded by a loan using a sector lending approach of ADB. The Executing Agency is the Ministry of Urban Development and the implementing agency is the Department of Water Supply and Sanitation (DWSS).

3. The outcome will be inclusive and sustainable water supply and sanitation service delivery in selected small towns in Nepal. The project will implement improvements/rehabilitation works within the service area of already completed 24projects. There will be minor civil works necessary for the enhancement of the components without changing the original technical and social concepts.

1.2 Objectives of IEE

4. The updated IEE summarizes anticipated impacts and corresponding mitigation measures, monitoring and also includes cost and time frame for implementation.

1.3 Rational of IEE Requirement

5. The updated IEE report was approved by government of Nepal in 2005. Now the sub project is envisaged to undergo for rehabilitation of project components such as, treatment plant (specific area) of transmission and distribution line etc. The proposed IEE is prepared as an integral part of bid document. However consultant has updated the contents of IEE report already approved from government of Nepal.

1.4 Methodology Used in Preparing IEE

- In the process of preparation of EMP, an extensive review of approved IEE and feasibility reports reviewed with some field based information
- Public consultations were held in the entire process of IEE study and during the disclosure of the draft IEE report to the local people. These processes have taken place and the results were documented. The involvement of the local people in EMP implementation activities have been recommended in EMP, 2000. Accordingly, in the process of EMP implementation, the following mechanism has been adopted to involve the local people in EMP activity:
    - Public Consultation and Involvement have been given highest priority in the implementation of Mitigation measures carried out by EMP; initially prior to the implementation, public consultation usually takes place and on the basis of decision of the consultation meeting, implementation of mitigation measures are being prioritized and carried out with the involvement of local people.
    - Monitoring is another component of EMP. Monitoring of Physical, Biological and Socio-economic components of Environment of the project is being carried out. In the process of compliance monitoring of the project construction, local people and construction workers are being involved and consulted

2. POLICY, LEGAL & ADMINISTRATIVE FRAMEWORK

2.1 ADB Policy

6. All projects funded by the ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects undertaken as part of programs funded under ADB loans are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. With respect to the environment, the SPS 2009 is underpinned by the ADB Operations Manual, Bank Policy (OM Section F1/OP, 2010). The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.1

2.2 ADB Safeguards policy

7. ADB's environmental safeguards policy principles are defined in SPS, 2009, Safeguard Requirements[1] 1 and the IEE is intended to meet these requirements, Table 2-1.

Table 2-1: ADB SPS, 2009 Safeguard Requirements 1: Environment

SPS 2009 - Safeguard Requirements	Remarks
Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.	REA has been undertaken (Annex A), indicating that 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
SPS 2009 - Safeguard Requirements	Secondary influence areas. Significant adverse impacts during construction will be temporary and short-term, can be mitigated without difficulty. There is no adverse impact during operation. Hence, IEE is sufficient. The IEE including specific description of the environment and corridor of impact will be updated as necessary based on the final design and alignments.
Conduct EA to identify potential direct, indirect, cumulative, & induced impacts and risks to physical, biological, socioeconomic (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 transboundary global impacts, including climate change.	IEE has been undertaken to meet this requirement. (Section VI). No transboundary & global impacts, including climate change.
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.	Analysis of "with-subproject "or "without subproject" is presented in Section III.
Avoid, and where avoidance is not possible, minimize, mitigate, &/or offset adverse impacts and enhance positive impacts by means of environmental planning & management. Prepare an EMP that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity	An EMP has been prepared to address this requirement. Section IX

[1]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

SPS 2009 - Safeguard Requirements	Remarks
development and training measures, implementation schedule, cost estimates, and performance indicators.	
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 (Annex C). A grievance redress mechanism for the resolution of valid project-related social and environmental issues/concerns is presented in Section VIII.
Disclose a draft IEE (including the EMP) in a timely manner, before project appraisal, in an accessible place & in a form & language(s) understandable to affected people & other stakeholders. Disclose the final EA, & its updates if any, to affected people & other stakeholders.	The draft IEE will be disclosed on ADB's website prior to project appraisal. Copies of both SPS-compliant IEE and Government of Nepal-approved IEE will be made available at the offices of the PMO, Project Implementation Support Unit (PISU) and Water Users' and Sanitation Committee (WUSC)for public consultation. For the benefit of the community, the summary of the IEE will be translated in the local language and made available at (i) offices of executing and implementing agencies, (ii) area offices, (iii) consultant teams' offices; and (iv) contractor's campsites. It will be ensured that the hard copies of IEE are kept at places which are conveniently accessible to people, as a means to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE will be placedin the official website of executing and implementing agencies and the ADB website after approval of the IEE by ADB
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 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,	The subproject does not encroach into areas of critical habitats.

SPS 2009 - Safeguard Requirements	Remarks
and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.	
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 only minimally applicable to the subproject in the aspect of waste generation, e.g., effluent from septic tanks and generated sludge and sludge disposal from water supply and sanitation structures. The subproject will not involve hazardous materials subject to international bans/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 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 to mitigate adverse impact on physical cultural resources (PCRs) in case of chance find.

2.3 Nepal's Environmental Policy and Legal Framework

8. The Interim Constitution of Nepal, 2007 defines the right to live in clean environment as one of the fundamental rights of its citizens (Article 16). It prescribes for the State to give priority to the protection of the environment and prevention of its further damage due to physical development activities (Clause 5 of Article 35). Proceeding from, and conformable to, the Constitution, the Government of Nepal has passed a series of environmental laws, policies and implementing regulations and standards. Among these, the basic legislation that provides the framework within which environmental assessment is carried out in Nepal is the:

- Environmental Protection Act (EPA), 1997,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 or Ministry of Science, Technology and Environment (MoSTE), respectively, prior to implementation. The 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 MoSTE) 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 (EPR), 1997, and its amendments in 1999 and 2007. 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 2007.
- Other environmental and core labor policies, laws and rules that are relevant to the subproject are presented in Table 2-2.

Table 2-2: Other Relevant Environmental and Core Labor Policies, Laws and Guidelines of Nepal Applicable to the Subproject,

Policy/Law/Guideline	Year	Relevant Provisions	Remarks
Resources Act	1992	Comprehensive law on the development, use and conservation of water resources in Nepal, it aims to minimize damage to water bodies by requiring the conduct of IEE & preparation of IEE Report before granting license to use water resources for any purpose.	Government of Nepal environmental assessment report will be prepared based on this IEE.
		Proponents shall make sure that the beneficial use of water resources does not cause damage to other water uses/users (Article 4).	The source is groundwater to be drawn from the deep aquifer. Prevailing water source is the shallow aquifer and water drawn has Mn, Fe, Al and coliform levels exceeding National Drinking Water Quality Standard (NDWQS). Hence, people are eager to be connected to piped water supply system.
		Article 17 requires proponents to apply for any necessary land acquisition accordingly;	Site for the intake well, treatment unit, overhead tank is government land (Dept. of Forest).
		Article 18 requires the compliance to quality standards in making use of water resources. Article 19 prohibits the pollution of water resources. Under the Act are two regulations for drinking water purposes: (i) Water Resources Regulation, 1993, setting out the implementation procedures for the Act; and (ii) the Drinking Water Regulation, 1998, which specifies compliance with the drinking water quality standards and control of water pollution (or sanitation) as it affects drinking water.	Environmental Management Plan prescribes the compliance with NDWQS and its Directives during operation.
Labor Act	1992	Chapter 5 stipulates health and safety provisions at work places, keeping work premises clean and safe, e.g., (i) with provisions for solid waste, sewage and hazardous substance management; (ii) instituting measures to prevent dust, fumes and other impure materials that would adversely affect health; (iii) with supply of potable water and water for emergency situations; (iv) with arrangements for the use of protective devices and wears; (v) with fire safety arrangements; and (vi) measures for protection from hazardous machines/equipment and from physical injury or harm from lifting of heavy weights.	EMP provides measures to mitigate workers' health and safety hazards.

Policy/Law/Guideline	Year	Relevant Provisions	Remarks
Forest Act	1993	The Act prohibits the extraction of boulders, rocks, pebbles, sand or coilfrom 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.	Subproject will not impact on any forest. EMP stipulates no illegal quarrying of natural aggregate materials.
National Environmental Policy and Action Plan (NEPAP)	1993	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.	Subproject will not impact on physical cultural heritage & biodiversity. EMP provides measures to mitigate impacts.
National Water Supply and Sanitation Policy	1998	The Policy requires the: (i) monitoring of water quality supplied by completed WSS projects; and (ii) evaluation of their benefits in improving health (e.g., reducing water-borne diseases) and in relieving the sufferings of women and other disadvantaged groups in carrying out their responsibilities over water collection and maintenance of sanitation and hygiene.	Monitoring of the quality of supplied water is prescribed in the EMP following the NDWQS Directives.
Drinking Water Rules	1998	The Rules: (i) gives the procedure for the settlement of dispute on use of water sources; (ii) requires water supplier to maintain the quality of water as prescribed in the Water Resources Act; (iii) prohibits water supplier to construct structures and conduct activities that would pollute the water source and cause significant adverse effect on the environment.	Monitoring of the quality of supplied water is prescribed in the EMP following the NDWQS Directives.
Local Self-Governance Act	1999	The Act gives Local Government the functions, duties & powers to: (i) conserve & protect their local environment & natural resources; (ii) plan, implement &/or operate & maintain local WS projects; (iii) implement or arrange for implementation local sanitation/sewerage & drainage projects; (iv) protect cultural heritage & religious sites; &/or (v) monitor project activities within their respective jurisdictions.	Provides basis for Local Government to monitor the environmental performance of the subprojects. EMP provides the responsibilities of Local Governments (LGs) in EMP implementation.
National Urban Policy	2007	Policy gives importance to environment conservation while carrying out urban development works and natural	Government of Nepal Government of Nepal environmental assessment report, based on this IEE,

Policy/Law/Guideline	Year	Relevant Provisions	Remarks
		resource use; thus, supporting the required environmental conservation and protection in donor-assisted development projects.	will be prepared to ensure environmental conservation and protection.
National Urban Water Supply and Sanitation Sector Policy	2008	The Policy requires the IEE or EIA of proposed WSS projects in accordance with the EPA/EPR to: (i) incorporate consultations with key stakeholders, including end-point users; & (ii) specify measures to mitigate environmental impacts prior to, during construction & operation, as well as corrective measures.	Government of Nepal environmental assessment report will be prepared based on this IEE. This ADB IEE will be submitted to ADB for review and approval.
Implementation Directives for the National Drinking Water Quality Standards	2005	It sets out the water sampling, testing, analysis, monitoring and surveillance procedures to certify that the quality of supplied drinking water conforms to the National drinking Water Quality Standards.	Monitoring of the quality of supplied water is prescribed in the EMP following the NDWQS Directives.
Updated 15-Yr Development Plan for Small Towns Water Supply and Sanitation Sector	2009	The Plan defines the population threshold of “small towns” to be in the range of 5,000 to 40,000. Reference to Schedules 1 and 2 of the EPR, as amended in 2007, places water supply projects in small towns under Schedule 1 or within the threshold of water supply projects requiring only an IEE. The Plan emphasizes monitoring and evaluation as an important component of a project to determine the overall impact of a project.	EMP prescribes environmental effects and performance monitoring.
Solid Waste Management Act	2011	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 have the duty to reduce the amount of solid waste generated while carrying out work or business.	EMP prescribes eco- friendly management of solid and hazardous wastes.

9. The key Government of Nepal environmental quality standards are: (i) National Ambient Air Quality Standards for Nepal, 2003; (ii) National Noise Standard Guidelines, 2012; and (iii) National Drinking Water Quality Standards, 2006, which would also be applied to surface and ground water quality monitoring since these resources are used for drinking.

10. Nepal is party to the following international environmental agreements that have broad relevance to works and environmental assessment of works under the project: (i) World Heritage Convention, in 1978; (ii) Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention), in 1987; (iii) Convention on Biodiversity, in 1992, (iv) Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol and subsequent London Amendment, in 1994, and (v) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, in1996.

11. The relevance of the aforementioned environmental agreements to the subproject are on their emphasis for human activities (such as development projects) to: (i) take on/institute measures to protect the local, as well as global, natural resources and/or environment; (ii) prevent and/or reduce the causes of climate change; and (ii) anticipate and mitigate the adverse impacts of climate change. The country is also committed to the Millennium Development Goals (MDG), 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 population with sustainable access to safe drinking water and basic sanitation.

3. ANALYSIS OF ALTERNATIVES

3.1 Alternatives considered in the approved IEE report 2006

12. The proposed KWSSP has limited but reliable sources of water to meet the present water demand. The existing Gadeuli and Gewang khola sources can be utilized for the proposed sub-project with extension and improvements. Both the sources are reliable in terms of yields. However, the water should be treated to improve the quality of drinking water. The existing Kamalamai water supply system is a pumping system that provides water supply services to ward no 4, 6, 7 and 9 of Kamalamai Municipality. A spring located near the existing intake site of Guwang Khola has also been tapped in the Guwang Khola system.Different alternative sources of surface water were discussed with users and WUSC for proposed water supply schemes. The field observations and discussion with the users and WUSC identified following possible site alternatives as sources of drinking water for the area.

3.1.1 Site Alternative

13. The main objective of the proposed sub-project is to establish the sustainable water supply system to the communities of the five wards (ward nos. 4, 5, 6, 7 & 9) of Kamalamai municipality. However, different alternative sources of surface as well as ground water were discussed with water users and WUSC for alternative proposed water supply and identified following possible site alternatives as sources of drinking water.

Guwang Khola Source

14. Guwang Khola is originated from Mahabharat range from north-east part of the district. The drainage basin area of the proposed intake site is 4.72 km^2. The basin lies below the elevation of 3000m. High and low flow of the stream is calculated using Hydest Software for this stream. The daily flow and lowest flow for different return period is presented in the table below;

Return Period	Low Flow (m3/s)	Daily Flood Flow (m3/s)
2 years	0.099	4
10 years	0.0382	9
20 years	0.0281	12

15. The data above table shows that 20 years return period low flow is 28.1 lps., which can be considered as a minimum discharge of the stream.

Gadeuli Khola Source

16. Gadeuli Khola is also originated from Mahabharat range from the eastern part of the district. The drainage basin area of the existing intake site is 14 km^2. The basin also lies below the elevation of 3000m. Daily flood and low flow calculate the Hydest Software for this stream for different return period is presented in the table below: the reservoir site.

Return Period	Low Flow (m^3/s)	Daily Flood Flow (m^3/s)
2 years	0.2043	20
10 years	0.103	51
20 years	0.842	66

17. The data above table shows that 20 years return period low flow is 84.2 lps., which can be considered as a minimum discharge of the stream.

3.1.2 Important findings on the analysis of alternatives studied in 2005

No project alternative

18. If the proposed project is not implemented in KamalamaiMunicipality, there will be no impact of any dimension. However, the benefits occurring from water supply system or drinking water supply will also be not available. The local people may not affordindividually for adopting the technologicaltreatment of surface and groundwater contaminations. Employment opportunities for locals will be limited to what they are having now.

Technology alternative

19. After the field verification and discussion with the WUSC members and DWSO personnel the field team reaches into the conclusion that both the system can be merged in a single system for supplying water to Kamalamai area. For this the Gadeuli system will be discarded and the water will be drawn from the Guwang Khola alone. This discharge of Guwang Khola with existing spring source will be sufficient for the water requirements of Kamalamai.

3.2 Alternatives for the Updated IEE

20. The water supply system for the town of Kamalamai was constructed several years before under STWSSP 1, funded by ADB. The project is in operation at present. The WUSC is the operating agency. The project had anticipated a 24 hour service and water quality standards within the NDWQS. After a few years of operation, it was observed that this anticipation was not fulfilled due to some problems. The problems were observed both in technical as well as social and institutional field. Therefore some enhancement measures were necessary. This project is designed to cater for such enhancement works.

21. IEE had been carried out in accordance with the prevailing rules and regulations of ADB and the GoN incorporating the alternatives like “without –sub project or do nothing” and “with sub-project” was carried out in 2005.

22. As such, alternatives for the water supply project have not been studied in the design report.

4. DESCRIPTION OF SUBPROJECT

4.1 The Study Area

23. Kamalamai Small Town Water Supply and Sanitation project is located in Sindhuli district of the Central Development Region of Nepal. The service area of the project lies in Kamalamai municipality.

24. The average altitude of the municipality area is about 550 m above mean sea level. The area is situated at the foothills of the lower Mahabharat range of mountains and is northward extension of the inner Terai belt of Kamala valley. The municipality is named after the major river of the area Kamala and is situated between two tributaries of Kamala, viz., Gwang in the west and Gadeuli in the east. . The Banapa-Bardibar road (BP Rajmarga) passes through the project area, which links Kamalamai with other towns of Nepal. The nearest airport from the project area is Biratnagar Airport.

25. The project area has tropical monsoon climate with an average maximum temperature of 32^0 c and average minimum annual temperature of 20^0 c, based on the climatological data of KamalamaiGadi (Index no. 1107). The average annual rainfall is 2,765 mm, 80% of which occurs during monsoon (June to September). Maximum observed total annual rainfall in this station is 3,706 mm, which is about 125% more than the national average. The key climatic parameters of the district based on the data of KamalamaiGadi published.

26. The project was initially implemented to serve ward no. 4, 5, 6, 7 & 9 of Kamalamail Municipality. According to the financial appraisal report of TDF, the project had been designed to serve a total population of 12041 in the base year 2006 and 17,875 in the design year 2020. It is estimated that the design population for the year 2030 will be33,656. Therefore the present enhancement project design population is taken as 21,335. The service area for this project remains the same.

27. The core area of the project is Bazaar area situated along both sides of the main road. This area is densely populated market area where main economic activities are carried out. The service areas adjoining to the core area have either semi-urban or rural type settlements, where the settlement pattern ranges from moderately dense to scattered.

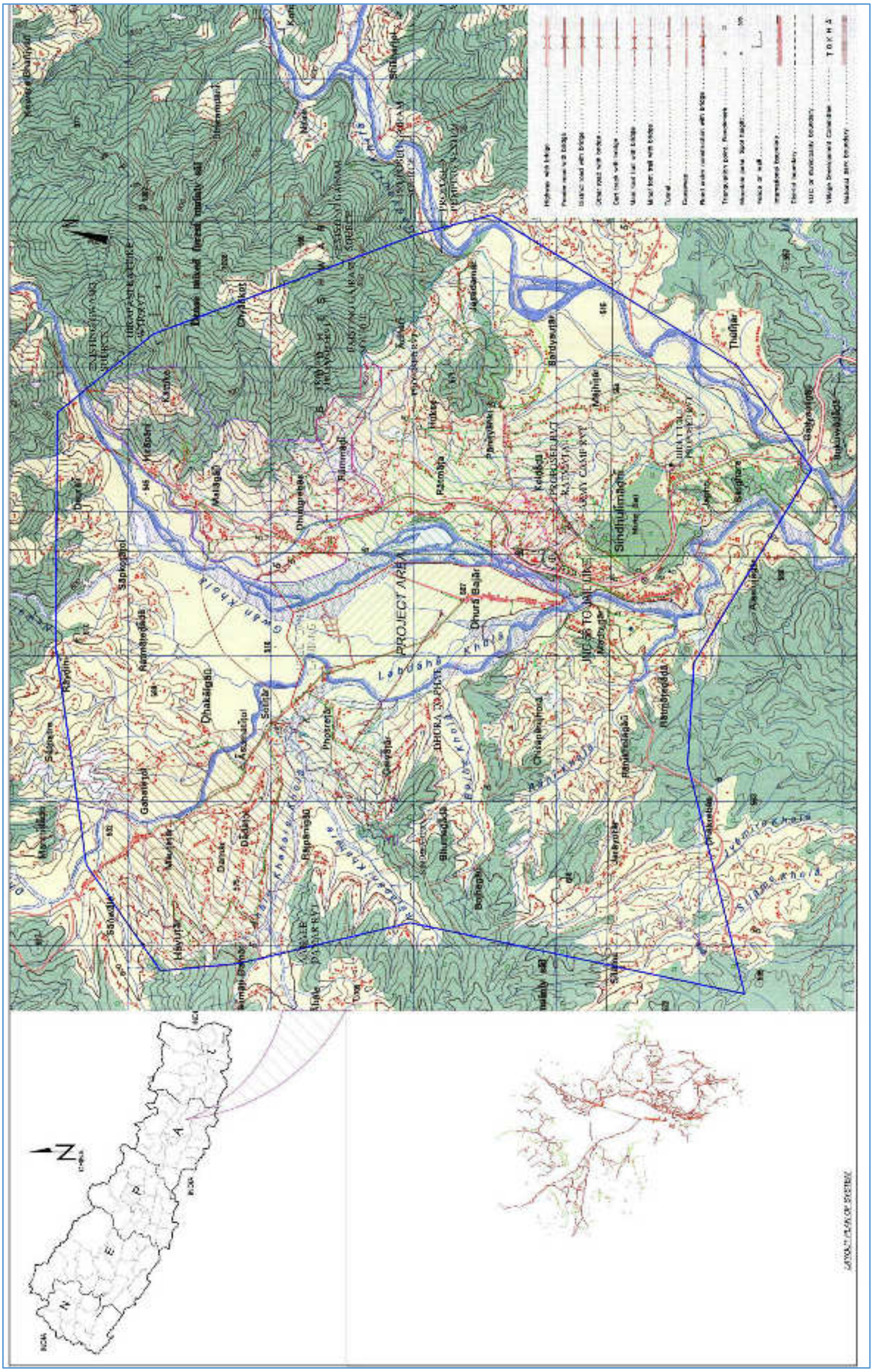


Figure 4-1: Location of the project Area

4.2 Existing Condition and Need for the Subproject

28. The sub-project includes the following works;

- Construction of 550 m^3 ground reservoir
- One water treatment plant with SSF facility and 10 lps capacity
- 27.35 km of pipe line laying
- Construction of Chlorination unit
- One surface water intake consisting of infiltration gallery at source river

The technical details are shown in Table 4-1.

4.2.1 General Information

1. . Name of the Project : Enhance Functionality in Small Town Water Supply and Sanitation Sector Project

2. Name of Sub-project : **Kamalamai Small Town Water Supply & Sanitation Project, Kamalamai**

3. Service Areaof theProject: Ward no. 4, 5, 6, 7 & 9 of Kamalamai Municipality.

Total Project Cost NRs. 87,470,309

4.2.2 Technical Information

29. Details of technical information are mentioned in Table 4-1.

Table 4-1: Technical Details

S. No	Name of structure	Existing	Additional	Total
1	No. and capacity of Reservoirs:	10(725 cum)	5(550 cum)	15(1,275 cum)
2	Treatment Facilities	2(27 lps, HRF,SSF) Chlorination Unit	1(10 lps, HRF,SSF) Chlorination Unit (Rehabilitation)	3(37 lps)
3	Pipeline Length:			
3.1	Transmission	17.0 km	19.55 km	36.55 Km
3.2	Distribution	50 km	7.8 km	57.8 Km
3.3	Total	67.0 Km	27.35 Km	94.35
4	Guard House	2	None	2
5	Generator / Operator House	2	1	3
6	Chlorination Unit with lab	None	2	2
7	Office Building:	One	One	One
8	Surface Intake/Borehole Drilling:	Surface Intake 2	2 (surface)	4
9	Fire hydrant	four	None	None

S. No	Description	Existing (2014)	Design year (2022)	Design year (2030)
10	Household connection	4,061	5,026	6,308
10.1	Fully plumbed	2,355	3,719	5,677
10.2	Yard connection	1,706	1,307	631
10.3	Community		11	14
10.4	Institutional	92	115	140
10.5	Total	4,153	5,152	6,462
11	Total Water Demand			
11.1	MLD	2.64	3.40	4.41
11.2	LPS	30.5	39.4	51

4.2.3 Socio- Economic Information

Total Household Number and Population (Pop.)
a) Present year(2014): 4,061/21335
b) Design year (2022): 5,026/26,796
c) Design year(2030): 6,308/33,656

4.2.4 Financial Information

1. The financial planning for the enhancement project is as follows;
   - Total investment 100%
   - Government: Grant 70%
   - WUSC Contribution: 5 – 10% of total investment as cash (% to be decided later)
   - TDF Loan: 20 – 25% of total investment to be provided to the WUSC (% to be decided later)
2. Weighted Average Tariff NRs 8 per cum
3. Cost Per Capita and per household

Description	Base year 2014	Design Year 2022	Design Year 2030
Cost per Capita	4,099.85	3,264.30	2,598.95
Cost per House hold connection	21,539.11	17,403.56	13,866.57

4.3 Sub Project Construction schedule

30. It is expected that the contract will be awarded by the last week of November 2015 and the construction work will be completed by the last week of August 2016. The detail of work is shown in Figure 4-2.

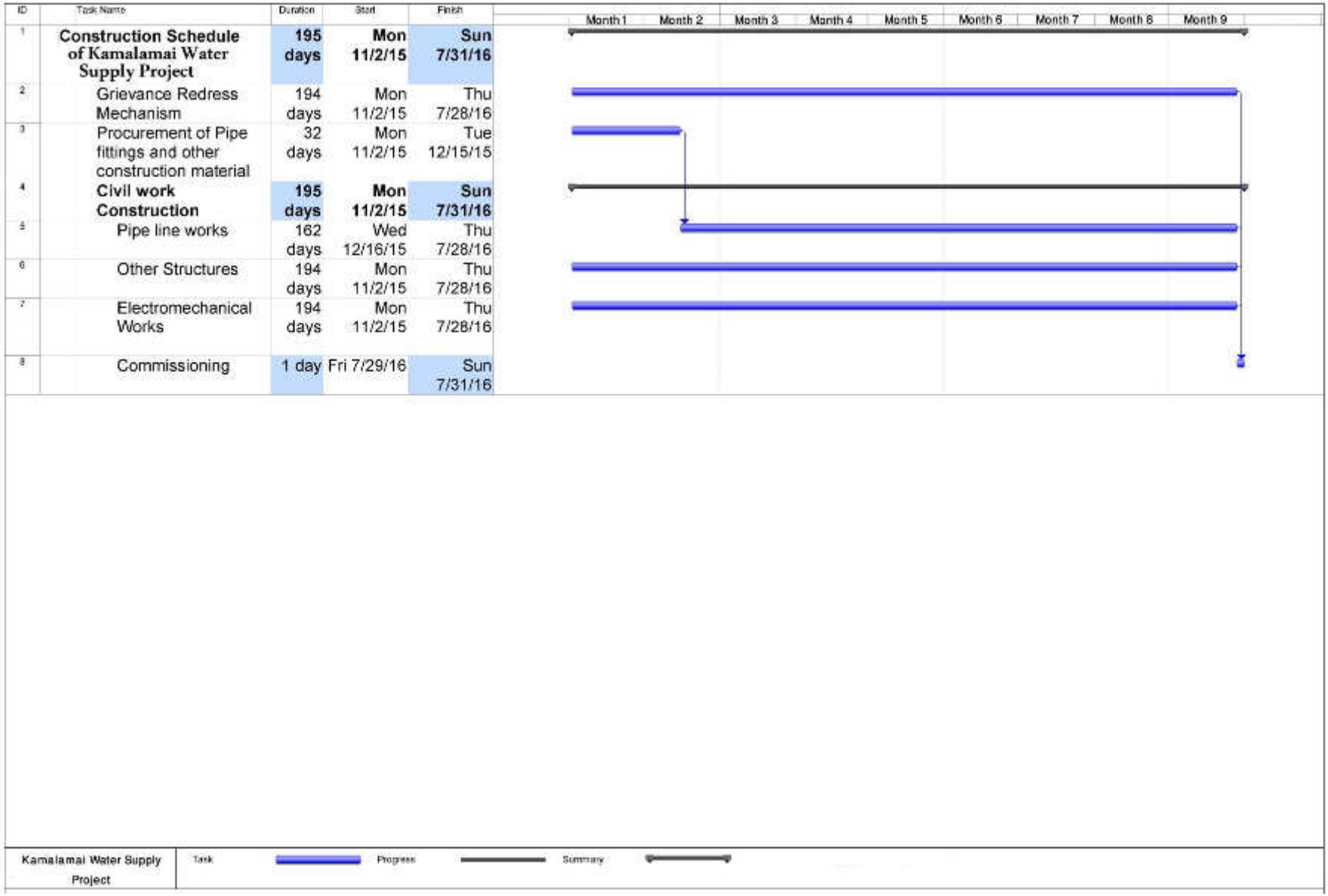


Figure 4-2: Construction Schedule

5. DESCRIPTION OF THE ENVIRONMENT

5.1 Physical profile

5.1.1 Topography

31. Kamalamai Water Supply and sanitation sub project is located at Kamalamai municipality, Sindhuli district in Central Development Region. The shortest (Banepa-Bardibas road) route from Kathmandu joins to the eastern Nepal passess through the Kamalamai municipality, which is under construction at present. So, this place is near future is going to be very important city.

32. The main river of the municipality is Gwang Khola and Gadeuli Khola flowing N-NE to SW. These two rivers in the southern direction join Kamala River flowing east to west. These rivers are perrinnial and originated from Mahabharat range. The area is mountainous cut across by rugged topography. The area embraces the low hills of inner Churia range in the south and Mahabharat range in the north. Thinner Churia range consisting of younger Cenozic rock runs east west closely follows the trend of main boundary fault.

33. Guwang Khola has big flood plain than the Gadeuli Khola. The altitude ranges from 507m to610m from above mean sea level in the flood plain area. Comparatively small cultivated terrace of land is found along the bank of Gadeuli Khola. In the ridge portion, thin bushes and forest occupy the area. In this hilly area altitude varies from 800m to 1372m above mean sea level.

34. Kamalamai is the most eastern district in Nepal, located in central development region, bordering Ranichuri, Ranibas, Bhimsthan and belghari VDCs in east and Dadi Gurase and Bhadrakali VDCs in West. The district is bordered by Sarlahi, Mahottari and Dhanusa in the North, and Ratanchura and Vadrakali VDCs in the South. The northern part of the district constitutes the chure hill border. The district extends 33 km from east to west with an average width of 7 km.

5.1.2 Geology and Soils

35. The proposed project and service area lie more than 95 percent of KamalamaiMunicipality which is composed of Siwalik formation. This formation is divided into the three parts: a. Upper Siwalik Formation (conglomerate and Clays), b. Middle Siwalik formation (pebbly sandstone and clay), c. Lower Siwalik Formation (Grey sandstone and shale, pebbly sandstone and clay).

36. Lower Siwalik and middle Siwalik formation follow the existing sequence from south to north. Within this formation small fault is marked. Again after the upper Siwalik lower Siwalik is exposed. This shows fault zone in between lower and upper Siwalik formation. Finally, lower Siwalik formation is interrupted by main boundary fault. The main boundary fault separates the Siwalik formation and metamorphic series of rock.

37. The existing intake (Gwang and Gadeuli khola source) is situated on Metamorphic and Quartzite rocks with big boulders. Rocks are cracking and in weathering condition so that the soils are not in stable and soil consists muddy and gravel type. Some steep slope with few vegetation in the proposed intake's alignment route. Phyllite and Dolomite with Garnefiferus Phyllite and Quartzite rock are found in the project area. Similarly, exposed rocks around the intake are is phyllite and dolomite.

5.1.3 Surface and Ground water

38. The Kamalamai Water Supply Sub-project uses surface water from two surface sources namely Gwang and Gadyaul iKhola. There are two surface source intakes at respective two points of the Streams.

39. This intake from Gwang Khola is constructed at the stream source. The safe yield of Gwang Khola is 27 lps. The designyield is only 8lps. The water is thus abundance in the source. However, only 4 lps from Gwang is available in the system as measured at WTP site near HRF. Therefore the production is far less than demand. The low rate of flow is due to the low capacity of the TL due particularly to the alignment problem. The water intake at site has overflow particularly during wet season. The leakage in the TL is also contributing to loss of water after entry into the TL. The intake structure itself is damaged; particularly the gabion has already been washed off and in danger of flow disruption. It needs to be repaired.

40. This intake from Gadyauli Khola is constructed at the stream source. The safe yield of GadyauliKhola is 37 lps. The design yield is only 17lps. The water is thus in abundance in the source.

However, only 9lps is available in the system as measured at the WTP site near HRF. The low rate of flow is due to the low capacity of the TL due particularly to the alignment problem. The water intake at site has overflow particularly during wet season. The leakage in the TL is also contributing to loss of water after entry into the TL. The intake structure itself is damaged, particularly the gabion has already been washed off and in danger of flow disruption. It needs to be repaired.

41. The WUSC is recommending the lift system installation from Gadyauli River at Chuderdaha about 4 Kms from existing WTP.

5.1.4 Water Quality Analysis

42. In the enhancement project additional units of SSF and Chlorination are proposed. The detail analysis of the water quality report is presented in Annex 2 of this report.

43. Water quality analysis were done for all critical sub project components such as intake, water before and after treatment plant. Samplings were also done in the distribution networks as well as randomly selected HHs taps to assure the quality. Mainly Physical component testing was done as pH, Turbidity, Electrical conductivity temperature. Similarly the various chemical components were also tested mostly like Calcium, Iron, Magnesium, Arsenic, Ammonia, Chromium, Nitrate, Sulphate, Chloride, Fluoride and Total Hardness as well.

44. In biological mainly parameter like Total Coliform and Fecal Coliform were tested for. If any contamination is encountered simultaneously the chlorination unit, pressure filter unit, slow sand filter treatment units should be provided. In case of this Water supply sub project due to the presence of Coliform, SSF and Chlorination units are constructed and now functioning.

5.2 Biological Condition

5.2.1 Flora

45. The forest found in the project areaconsists of Bans, Karma Banjhi Sissau etc. Their local name, scientific name and family are listed below;

5.2.2 Fauna

46. Some of the wild animals found in the area consist of Kaliz, Bagh, Snake etc.

5.2.3 Protected Areas

47. There are no protected areas around Kamalamai.

5.3 Socio economic condition

5.3.1 Population, Communities and Occupation

48. The project was completed under STWSSP – 1 in 2008. The total population of the Municipality is around 32,838. The total population of proposed project comprises around 9854population and 1846 households. Brahmins and Chettris are the most ethnic groups in Kamalamai and Municipality, whereas, Newars, Magars, Tamangs, Danuwars, Hayus and Majhis, Chamars, Dooms, Mushahars, Nepalis and Bishwokarmas are the other groups residing in the area.The occupation of the inhabitants of the project area is agriculture and animal husbandry.

49. Now in the enhancement project the demographic figures were updated. As per the present scenario, the total present population is 21,335 and the design year population is 33,656. The other socio-economic condition was not studied because there is no major change.

5.3.2 Health and Sanitation

50. Deteriorating water quality, unsanitary condition and lack of personal hygiene are often blamed for the prevalence of water borne diseases. Diseases like diarrhea and dysentery are the most common in the Municipality and other diseases like skin irritation; infection and coughing etc are also common. Besides tuberculosis, encephalitis and malnutrition were reported during field observation. There is one health post in the project area to treat ordinary diseases. Lack of medicines and technical health workers at local area, it has become very difficult for local.

51. The sanitation condition of Kamalamai Municipality is good. 90% of the households in the market have access to household toilet. On the contrary, only 70% households have household toilets in the rural area with an average of 74% in the project area.

52. The sanitary situation of KWSSP area is moderate. The main commercial area of Kamalamai bazaar is located in ward no 6 whereas Dhura bazaar, Dhugrebas and Milan Chowk are other small market area. About 74% of households have toilet facilities within the project area and remaining 26% go to open field, forest, riverbank, backside of the house etc for the defecation, generally lower income group have these kinds of practices. Pour flush and vented improved pit latrines withy ring water seal slab are the common types of latrines constructed in the project area. Traditional pit latrines are also used in villages. Similarly, about 42% of the households having toiled facilities have VIP permanent type of latrines whereas 17% have water seal/ pour flush type of latrine. It was also found that 15% mostly lower mid income group have direct pit latrine.

53. There is no authority to handle solid waste problems in an organized way. Individual dispose their own solid wastes separately. However, to keep the commercial area clean, a sweeper is hired on monthly basis to collect, sweep and dispose the waste products. Solid wastes are dumped in jungle and along the highway. The existing sanitation situation of household is satisfactory. Road and foot trails are also relatively clean.

5.3.3 Economic Characteristics

5.3.3.1 INDUSTRIES

54. There are no major industries established in the KamalamaiMunicipality but some hotels, lodges and small-scale cottage industries exist in the main market of the municipality like 1number bazaar 2 number bazaar and dhura bazaar etc.

5.3.3.2 AGRICULTURAL DEVELOPMENT

55. Eighty three percent of the population depends on agriculture and animal husbandry profession. Vegetable farming is the most common agricultural practices.The main food grains are maize and millet. Potatoes and beans are the main vegetables. Horticulture is the main farming practices. “Junaar” is most famous fruits of Sindhuli districts.

5.3.3.3 MINERAL DEVELOPMENT

56. There is no mineral development in the area.

5.3.4 Infrastructure Facilities

5.3.4.1 WATER SUPPLY AND DRAINAGE

57. People who live on the bazaar area are benefited with piped water while the rural people depend on Guwang khola for drinking water as well as other purposes. Even though there is no sufficient drinking water for bazaar so many people expenses for ground water extraction as wells along the riverside. Besides, some people are depended on traditional wells for drinking water.However the situation has changed now and that most of the HH use WUSC distributed pipe connection.

5.3.4.2 COMMUNICATION

58. The bazaar has PCO facilities and several private telephones with one Ilaka post office. These communication facilities are limited only within the periphery of Bazaar and serving to the local peoples.

5.3.4.3 INSTITUTIONS

59. Several institutions like health post, police office, post office, agricultural development bank, water supply office, water users association office, Nepal electricity authority, municipality office, livestock office, an agriculture office, military office, telecommunication office, forest office, road department office etc are found in the core area of proposed water supply area of Kamalamai municipality of the main bazaar area in ward no 6.

5.3.4.4 ELECTRICITY

60. All the wards have not reach with electricity facilities. Only 20% of the people arereached with electricity facilities therefore it is mainly available in urban part of the municipality. The wards of 3, 8, 13, 14 and 18 are completely far from this facility whereas rest of the wards is also partially access of electricity. Almost all the households use fuel wood for cooking.

5.3.4.5 TRANSPORTATION

61. East- West highway is providing transportation facilities for the people. Kamalamai-Kamalamai-Kathmandu road is now under construction.

5.4 Resettlement, Relocation and Compensation Issue

62. The various project components do not require resettlement of households or relocation. The system network has followed public property line and hence the issue of resettlement or relocation is not evident. The minutes of stakeholder consultation meeting also suggests that there is no need of resettlement or relocation.

63. The land required for construction of treatment plant and reservoir has been purchased by the WUSC and there is no need to provide compensation from the project side.

6. DESCRIPTION OF IMPACT ASSESSMENT

64. No significant impacts of project construction and operation were anticipated (IEE, 2005), but the following impacts were likely to occur. The project is now in operational phase and that all the physical and biological and socio-economic cultural impacts have been mitigated. In the enhancement project as well the same type of impacts are likely to occur.

6.1 Physical Environment

65. Physical Impact covers impacts on physical resources such as air, water, soil, rocks etc. The positions of a water table keep on fluctuating up and down in relation to wet and dry weather. Porous sand and gravel aquifers yield more water than silt or clay deposits. Hence physical testing of soil structure will help understanding the water availability.

6.1.1 Impact on land use pattern

66. Intake structure, reservoir and treatment plant would require some land area in addition to permanent site to facilitate construction activities, which is envisaged to alter the land use during construction period. The implications of such land use may affect on soil, productivity and land use pattern.

6.1.2 Landslide, erosion and soil instability

67. As the project area is in the hilly area, there is a possibility of landslide and erosion particularly in the intake and transmission pipeline area. The potential of such risks during construction should be expected in the area as well as adjoining areas.

6.1.3 Impact on water/land quality

68. Excavation and construction spoils are the major outcomes of construction activity. Besides, the workforce camps and their sanitary behavior might produce unwanted waste materials. The spoils and waste materials may have adverse implications on adjoining water sources.

6.1.4 Impacts of sediments and Disinfecting Chemicals

69. Issues like release of sediments from treatment plants, and the use of disinfecting chemicals might affect the water quality. Such effects are minor in nature and can be easily mitigated during the operational phase.

6.1.5 Water Volume/Quality

70. Over extraction water may decrease the volume of water and improper treatment of water also decrease the quality of water which may arise issues affecting the ground water sources of water.

6.1.6 Impacts on Air Quality

71. Dust will be generated from inadequately managed or haphazard: (i) earthworks such as clearing, grubbing, excavations and drilling; (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; and (v) on-site rock crushing, cement mixing/concrete batching, borrowing. The significance of dust impact will be high in the bazaar area where more population reside and work and where urban socio-economic activities concentrate. Increase in concentration of vehicle- and process related pollutants will arise from the movement and operation of construction vehicles, equipment and hot-mix plants.

6.1.7 Impacts on Acoustic Environment

72. Noise and vibration emitting construction activities include earthworks, rock crushing, concrete mixing, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise and vibration impacts will be high in areas where noise-sensitive institutions such as health care and educational facilities are situated. These impacts will be temporary and short term.

6.1.8 Impacts on Traffic and Temporary disturbance

73. During construction phase, implementation of distribution network pipeline will create disturbance to local transport system. The significant impact will be seen in market and busy area only. These impacts will be temporary and short term.

6.2 Biological Environment

6.2.1 Impact on natural vegetation and ecology

74. The natural vegetation and ecology of the project area may be disturbed due to construction activities of the different project components. Besides, the activities of workforce on the adjoining forest may affect the habitat of wildlife.

6.2.2 Impact on aquatic life

75. The source being ground water no impact on aquatic life is envisaged due to implementation of the project

6.2.3 Loss of habitat

76. Clearance of vegetation along the bulk distribution pipeline, and trunk transmission pipeline, may result loss of some forested habitat of wild life and consequently affect the endangered species.

6.3 Socio-Economic and Cultural Environment

77. Many of the adverse impacts on socio-economic and cultural aspects will be limited to construction stage. The following socio-economic issues have been considered in IEE.

6.3.1 Land acquisition

78. The land required for the construction of permanent facilities has been managed by WUSC and no disputes are observed. Similarly there is no necessity of relocation or resettlement.

6.3.2 Outside workforce conflict/health/pollution/culture

79. Involvement of outside workforce in the local area may initiate conflict between the locals and outsiders due to cultural reasons. Disease transmission, pollution and competition for the available resources with outsiders might arise.

6.3.3 Workers' Health and Safety Hazards

80. Like communities, workers will also be exposed to the cross-cutting threats of the aforementioned impacts during construction. Inadequate supply of safe/potable water and inadequate sanitation facilities; poor sanitation practices on site; poor housing conditions; the handling and operation of construction equipment; handling of hazardous substances; exposure to extreme weather and nonobservance 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 in the workforce.

6.3.4 Water right Conflict

81. Involvement of outside workforce in the local area may initiate conflict between the locals and outsiders due to cultural reasons. Disease transmission, pollution and competition for the available resources with outsiders might arise.

6.4 Beneficial impacts

82. However there are some benefits of the project implementation; particularly on the following:

- Increase in agricultural and livestock products
- Employment generation
- Maintaining the health and sanitation activities
- Increase in quality of life values
- Change in cropping pattern

7. DESCRIPTION OF MITIGATION MEASURES

7.1 Physical Environment

7.1.1 Impact on land use pattern

83. The STWSSSP is located in Kamalamai municipality in the private land of about 1/2 Ropanis owned by WUSC. It was ensured in design, that the water retaining structures like RVT, WTP and others, are well protected with good drainage to be located on stable ground. Therefore, the project implementation would have less or no effect on soil, productivity and on the land use pattern.

7.1.2 Landslide, erosion and soil instability

84. Precautionary measures should be taken during construction to avoid caving while excavating for intake, reservoirs, pipeline etc. The excavated material should be safely disposed. Proper backfilling of excavated trenches should be done and construction activities should be avoided during the rainy season as far as possible.

7.1.3 Water/land quality

85. The project uses sub surface water that will be taken from below the water bed of the river by using infiltration gulley technique. Therefore the quality of water is expected to be clean. However the pollution in the surface water may have negative effect. The intake point is upstream from the settlement area and hence external pollution is also not foreseen. Thereforethere is less or minimum effect on water quality. Proper drainage system should be made to avoid water logging and the quality of water sources should be protected. Urination, defecation and dumping of solid and liquid waste in open areas, and water ways may be the potential cause of the pollution of surface and sub-surface water and such activities should be strictly prohibited.

7.1.4 Impacts of sediments and Disinfecting Chemicals

86. The water quality should be maintained within WHO standards. Filtration and chlorination should be provided to bring the water quality to acceptable levels. Similarly, a manual on water testing and chlorine dosing should be prepared and provided to WUSC.

7.1.5 Water volume

87. The water should be equally distributed to all the users in a controlled way. The amount of water that required should only be extracted.

7.1.6 Impacts on Air Quality

88. Some mitigation measures include: (i) confining earthworks according to a staking plan and excavation segmentation plan that should be part of the working documents and/or C-EMP; (ii) watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary; (iii) if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces; (iv) during demolition, watering of exterior surfaces, unpaved ground in the immediate vicinity and demolition debris; (v) hoarding active work sites in populated areas; (vi) requiring trucks delivering aggregates and cement to have tarpaulin cover and maintain a minimum of 2' freeboard; (vii) limiting speed of construction vehicles in access roads and work sites to maximum of 30 kph; and (viii) providing pollution controls in batching and hot-mix plants.

7.1.7 Impacts on Acoustic Environment

89. Some mitigation measures include: (i) using equipment that emit least noise, well maintained and with efficient mufflers/exhaust silencers; (ii) restricting noisy activities to daytime and overtime work to avoid using noisy equipment; (iii) limit engine idling to a maximum of 5 minutes; (iv) spread out schedule of material, spoil and waste transport (v) minimizing drop heights when loading and unloading coarse aggregates; and (vi)Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.

7.1.8 Traffic and Temporary disturbance

90. Some mitigation measures include: (i) distribution pipeline work will be done during night time, (ii) diversion need to be made if work is of long duration.

7.2 Biological Environment

7.2.1 Impact on natural vegetation and habitat

91. The loss of vegetation from construction activities of contractors and construction workforce is recommended to be minimized through the enforcement of the following provisions.

- Prohibition on illegal felling of trees and encroachment of the community forest should be made mandatory.
- Progressive rehabilitation and afforestation of the areas not acquired by the project structures after the completion of the construction activities should be carried out. Such afforestation program is recommended to plant saplings of trees, shrubs and herbs by establishing a nursery or pre-arrangements of such saplings from the local or district level nurseries.
- To enhance the conservation of endangered, protected and threatened species, it is recommended to plant the saplings 2 times the number of felled trees.

7.3 Socio-economic and cultural environment

7.3.1 Land acquisition

92. The land required for the construction of permanent facilities has been managed by WUSC and no disputes are observed. Similarly there is no necessity of relocation or resettlement.A provision of adequate compensation for the land acquired from private citizens should be made, if required. The loss of land property should be compensated through adequate cash compensation to the land owners. Vegetation and agricultural products should be compensated through the afforestation and agricultural enhancement programs in the SWSSSP area.

7.3.2 Outside workforce conflict/health/pollution/culture

93. Outside workers should be provided with the facilities of camps and should be instructed to not to; i) indulge with local people ii) involve themselves for hunting of wildlife iii) involve themselves in social disharmony activities.

7.3.3 Workers' Health and Safety Hazards

94. Some of the mitigation measures for community health and safety hazards: (i) strictly enforce on workers the use of protective wears; (ii) provide safe access to and from work sites; (iii) provide adequate housing at the workers' camp with adequate basic services and provide adequate water supply and sanitation facilities at work sites; (iv) arrange with nearest health center and hospital for health care and emergency care of workers. Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety.

7.3.4 Water right Conflict

95. The temporary settlement for the workers should be provided with temporary water taps. Open defecation should be controlled. Temporary toilets need to be constructed.

7.4 Enhancement of Beneficial Impacts

96. Some of the beneficial impacts from the implementation of the project should be enhanced by;

- Community mobilization and people's participation in health and sanitation programs should be promoted,
- Training an awareness programs in health and uses of water and its importance (water cost, saving, reuse, recycle, water pollution etc.) should be given,
- Technical training to the local people on plumbing, chlorination, water testing, pump maintenance and repair should be conducted.

7.5 Activities for Rehabilitation Work and its Mitigation Measures

97. As this rehabilitation project is for previously implemented and operated in a satisfactory order with minimal rectification works. Physical, Biological and Social environment are described respectively in Section 7.1, 7.2 and 7.3. Slight changes are in social that is increased population, number of stakeholders for which additional distribution lines with ancillary works are to be done. Major focused were given for the technical rectification which need to be done during enhancement work are summarized in Table 7-1in details. Most of the recommended mitigation measures will be incorporated in the contractual obligations and constructions works to be completed by the contractors. Facilities like water treatment plant, water testing laboratory etc are also either existing or to be installed is also included in the contract. Mitigation measures and monitoring plan of each rehabilitation activities is mentioned inTable 10-2, in Chapter 10.

Table 7-1: Activities for Rehabilitation Work

S.No	Name of Structure	Type	Existing Capacity(Q=lps, RVT=cum, WTP lps)	Design Capacity(lps)	Major problems	Required Intervention
1	Intake 1(GuwangKhola)	**Spring and stream**	4.00	8.00	Weir is damaged in both intake, due to which scouring in downstream side.	Intake improvement by constructing Gabion works(cascade fall structure)
	Intake 2(GadyauliKhola)	**Stream**	9.00	17.00		
	Total=		**13.00**	**25.00**		
2	Reservoir					
2.1	Reservoir 1	GRT	70+(2nos 20m3 Ferro-cement RVT Existing)	110 cum	Bulk water meter is not available Leakage and Cracking in RVT1(70cum) and RVT 7(40 cum).	V-notch measuring system will be installed. Plastering in RVT 1 and 7.
2.2	Reservoir 2	GRT	225	225		
2.3	Reservoir 3	GRT	103	103		
2.4	Reservoir 4	GRT	54	54		
2.5	Reservoir 5	GRT	35	35		
2.6	Reservoir 6	GRT	150	150		
2.7	Reservoir 7	GRT	40	40		
2.8	Reservoir 8	GRT	7	7		
	Total		724 cum	724 cum		
3	Treatment Plant					
3.1	Plain sedimentation Tank.(Gadyauli System)				Leakage in PST.	Improve PST-Plastering.
3.2	Plain sedimentation Tank.(Gwang System)				Stream undercutting in gabion wall near PST Absence of cover in PST leading clogging.	New apron is necessary. Gabion mesh and chicken wire mesh in roof recommended.

S.No	Name of Structure	Type	Existing Capacity(Q=lps, RVT=cum, WTP lps)	Design Capacity(lps)	Major problems	Required Intervention
					PST is inaccessible due to false gate arrangement.	Relocate the gate in south side from north side.
3.3	Horizontal Roughening Filter (Gadyauli source System)				Leakage Problem	Plastering required.
3.4	Horizontal Roughening Filter (Guwang source System)					
3.5	Slow Sand Filter (Gadyauli System)				LeakageSand media not per design.	Replace sand media accordingly.
3.6	Slow Sand Filter (Guwang System)				leakage Sand media not per design.	Replace sand media. New SSF is proposed.
3.7	Chlorination				Chlorination is not effective-Manual dosing.	Propose new Chlorination unit.
5	Pipes & pipe fittings	HDPE, GI			TL from both intake is not laid per design and survey causing inadequate flow in RVTs. Distribution network is not per the design. DL are deeply buried due to construction of new metallic road.	TL 160mm(11km,6km) from Intake 1 and 2, has to be placed as per survey and design. Distribution network to be laid accordingly as per new design

8. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

8.1 Consultation

98. Stakeholder consultation and participation was an essential process in project preparation and this updated IEE. The process in engaging stakeholders and affected people during the conduct of the IEE involved key informant interviews, joint sites reconnaissance and on- site discussions with WUSC, and field random interview of stakeholders.

8.2 Initial consultation: the existing project

99. During the Feasibility Study, consultations were undertaken by the Design and Supervision Consultants. Stakeholder consultations have been continued through subprojects implementation and operation. All stakeholders were invited and encouraged to participate in community consultations. To facilitate the engagement of stakeholders, the PMO and RPMOs maintained good communication and collaboration with the WUSC and VDC. The PMO, RPMOS, Contractors and/or WUSC were opened to contact by the public on matters concerning the progress of the subprojects, adverse impacts, mitigation measures and environmental monitoring and grievances.

- Prior to construction, the PMO and TPO have conducted information, education and communication (IEC) campaign to ensure sufficient level of awareness/information among the affected communities regarding the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the PMO and TPO, and status of compliance with Government's environmental safeguard requirements, among others, are attained/provided. Billboards about the subproject, implementation schedule and contact details of the executing agency, PMO, TPO and Contractors have been set up at strategic locations within the subprojects' main areas of influence. The grievance redress procedure and details will have been posted at the offices of the PMO, TPO, WUSC and VDC.
- During construction, regular random interviews were conducted by the TPO every month to monitor environmental concerns of subproject communities.
- During operation, periodic random interviews were conducted by the PMO and
- TPO and WUSC to monitor the environmental concerns of sub-project communities.

8.3 The consultation during IEE update

100. The consultation was done in two phases

8.3.1 Phase I

101. During the engineering survey and design phase, the consultations met with the top level management of DWSS, WUSC officials, WS division officials in Kathmandu and concerned municipality offices, WS customers and general public in field. The main persons consulted during this phase are listed below;

Table 8-1: Lists of People and Institutions Consulted

S No.	Name	Designation
1	Mr. Ram Deep Sah	Director General
2	Mr. Tiresh Prasad Khatrai	Acting Project Director
3	Mr. Dr. Mahesh Bhattrai	PMC, Project Co-ordinator
4	Mr. Keshav Raj Bista	Deputy Project Director
5	Mr. Mahendradev Shrestha	Chairman
6	Mr. Gita Thapa	V.Chairman
7	Mr. Bhimprakas Shrestha	Secretary
8	Mr. Suraj Mishra	Treasurer
9	Mr. Lokbikram Thapa	Member

8.3.2 Phase II

102. After approval of Detail Design report, second level of public consultation was made to discussion issues regarding the environmental impact, resettlement, relocation and compensation with immediate stakeholders. Meeting was held on 2072/06/08 at site. In this phase overall project outcomes were discussed with all concerned stakeholders. Details of participants are presented in Annex 4.

8.4 Costs

103. All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) at local (field/ward/town) level will be borne by the concerned focal organizations at each level: WUSC at town level; PIU at regional level and PMO at central level.

9. GRIEVANCE REDRESS MECHANISM

9.1 Purpose of the Grievance Redress Mechanism

104. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of APs' concerns, complaints, and grievances related to social and environmental issues of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

105. 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. Every grievance shall be registered and careful documentation of process with regard to each grievance undertaken, as explained below. The environmental and social safeguards officer (ESO/SSO) at project management office (PMO) will have the overall responsibility for timely grievance redress on environmental and social safeguards issues. The Social Development Officer at the Regional Project Management Office (RPMO) will be the focal person for facilitating the grievance redress at VDC/Municipality level.

106. A town-level public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The social safeguards expert of the project management consultant (PMC) and DSMC's safeguards specialists will support the WUSC and DSMC community mobilisers with information/collateral/awareness material etc. to conduct the town-wide awareness campaign. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and project's entitlements.

107. A Grievance Redress Committee (GRC) will be formed at VDC/Municipality level, comprising District Chief WSS as Chairperson and Member of Secretary of concerned WUSC as the GRC secretary. The GRC members will be comprise of (1) RPMO social development officer, (2) representatives of affected persons, (3) DSMC's safeguards specialist (social/environment as relevant), (4) a representative of reputable CBO/SHG/organization working in the project area, and (5) contractor's representative. The secretary of the GRC, who will be responsible for convening timely meetings and maintaining minutes of meetings. The concerned social safeguards expert of DSMC will support the RPMO SDO and Regional Director DWSS to ensure that grievances, including those of the poor and vulnerable are addressed. All GRCs shall have at least two women committee members. Representatives of APs, civil society and eminent citizens are to be invited as observers in GRC meetings.

108. 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 affected persons, categorize and prioritize them and provide solutions within 15 days of receipt of complaint by WUSC; and (iii) ensure feedback to the aggrieved parties about developments regarding their grievances and decisions of the GRC. The grievance redress mechanism and procedure is depicted in Figure 9-1.

109. The GRM for the project is outlined below, 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:

9.1.1 First Level of GRM (WUSC-level)

110. The first level and most accessible and immediate venue for quick resolution of grievances will be the contractors, DSMC field engineers and PIU supervision personnel, who will immediately inform the W USC. Any person with a grievance related to the project works can contact the Project to file a complaint. The WUSC will document the complaint within 24 hours of receipt of complaint in the field, and WUSC will immediately address and resolve the issue at field-level with the contractor, supervision personnel of PIU and DSMC field engineers within 5 days of receipt of a complaint/grievance. The assigned DSMC 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 WUSC will forward the complaint issue to the VDC/Municipality level GRM.

9.1.2 Second Level of GRM (VDC/Municipality level)

111. The complainant will be notified by the WUSC that the grievance is forwarded to the VDC/Municipality –level GRM. The Grievance Redress Committee (GRC) will be called for a meeting. The GRC meeting will be called and chaired by the District chief of WSS. 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 WUSC. If the grievance remains unresolved within 10 days of receipt of complaint by WUSC, the matter will be referred to the third level. The RPMO SDO will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings and taking follow up action to see that formal orders are issued and the decisions carried out. If the complaints are related with IP/dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities should be involved.

9.1.3 Third Level of GRM (PMO Level)

112. Any unresolved or major issues at Municipality/VDC level will be referred to the PMO for final solution. The PMO's Project Director and WUSC Union representative will have special meeting to find solution. Decision has to be made within 15 days of receipt of complaint by WUSC. The Project Director will sign off on all grievances received by the PMO. The environmental and social safeguards officers (ESO & SSO) will be involved with support from the PMC Social/Environment Safeguards Experts. The Project Director will sign off on all grievances received by the PMO. The PMO Safeguard Officer will be responsible to convey the final decision to the complainant.

113. All paperwork (details of grievances) needs to be completed by the WUSC member secretary and circulated to the WUSC Chairperson and members. At VDC/Municipality level, the VDC/Municipality SDO will be responsible for circulation of grievances to the Regional Director, DWSS and other GRC members, prior to the scheduled meetings. The PIU SDSO will be responsible for follow-through of all escalated grievances. All decisions taken by the GRC and PSC will be communicated to the APs by the PIU social development and safeguards officer.

114. 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.

115. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB 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 DMCs. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the project GRM.

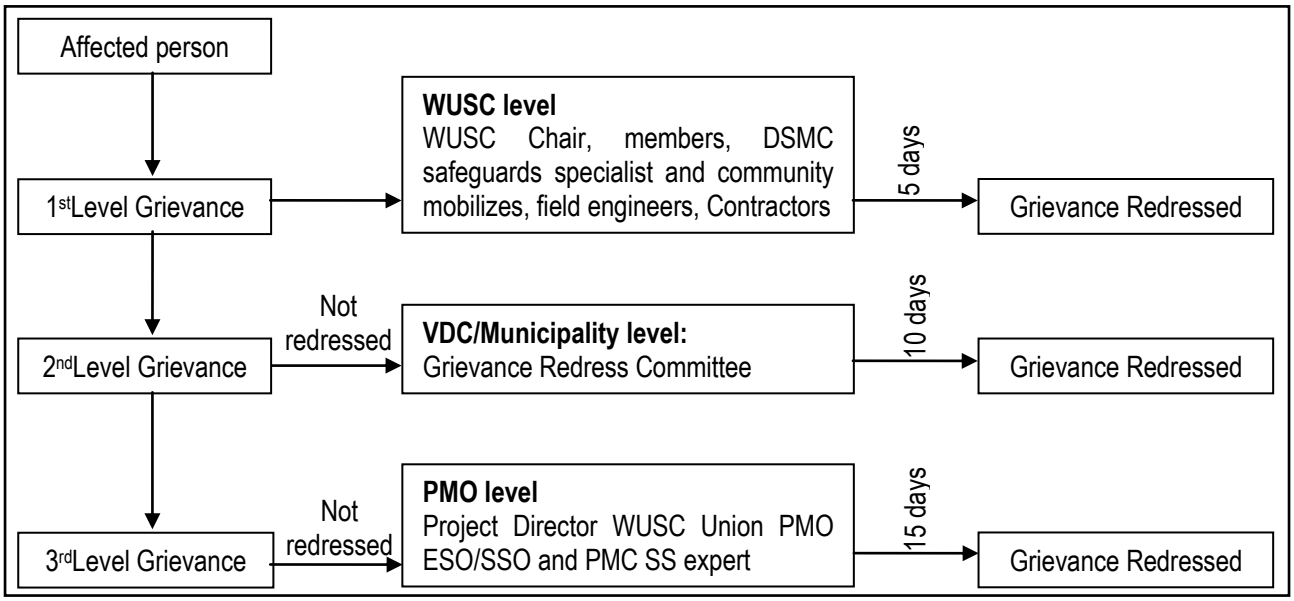


Figure 9-1: Grievance Redress Process

DSMC: Design, supervision and management consultant; ESO:Environmental and social safeguardsofficer;
GRC: Grievance redress committee; PD: Project director; PMC: Project management consultant;
PMO: Project management office; WUSC: Water user and sanitation committee.

Record keeping and disclosure

116. Records at the town-level will be kept by the concerned WUSC Member Secretary, of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date of the incident and final outcome. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the RPMO office, WUSC/municipal/VDC office, and on the web, as well as reported in the safeguards monitoring reports submitted to ADB on a semi-annual basis. For any grievance escalated to RPMO/VDC/Municipality level, the RPMO SDO will be responsible for record-keeping, calling of GRC meetings and timely sharing of information with WUSC. For grievances escalated to PMO and above, the PMO safeguard officers will be responsible for maintenance of records, sending copies to RPMO and WUSC for timely sharing of information with the person filing complaint.

117. Periodic review and documentation of lessons learned. The PMO social safeguard officer will periodically review the functioning of the GRM at town/WUSC level and PIU level and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances. Indicators pertaining to grievance redress (no. of grievances received, no. redressed/resolved to be reported by Member Secretary, WUSC to PIU SDSO, and by PIU SDSO to PMO ESO in monthly progress reports.

Periodic Review and Documentation of Lessons Learned

118. The PMO social safeguard officer will periodically review the functioning of the GRM at town/WUSC level and PIU level and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances. Indicators pertaining to grievance redress (no. of grievances received, no. redressed/resolved to be reported by Member Secretary, WUSC to PIU SDSO, and by PIU SDSO to PMO ESO in monthly progress reports.

10. ENVIRONMENT MANAGEMENT PLAN

119. 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 assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

120. A copy of the 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. The 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.

10.1 Institutional Arrangement

10.1.1 Executing and implementing agencies.

121. The Ministry of Urban Development (MUD) will be the executing agency with responsibility of subproject execution delegated to the Department of Water Supply and Sewerage (DWSS). The Water Supply and Sanitation Division/Sub-division Office (WSSDOs) are the subproject implementing agencies. Water Users' and Sanitation Committees of participating towns are the implementing agencies.

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

Prior to construction

- The MUD will deputize a qualified staff to act as the Environmental Safeguard Officer of the Project management office (PMO).
- The MUD will establish the grievance redress mechanism, including setting up the Grievance Redress Committee.
- The Water Supply and Environment Division of the MUD will be responsible for reviewing the IEE Report prior to submission to the Ministry of Science, Technology and Environment (MoSTE) for review and approval.
- The DWSS will review the IEE Report prepared by the Design and Supervision Consultants' Team's Environmental Safeguard Expert (DSMC-ESE) prior to forwarding this to MUD.
- The DWSS will prepare the ToRs for the Environmental Safeguard Specialist that will be engaged to support the PMO and for the Environmental Safeguard Specialists of the two Design and Supervision Consultants that will be appointed to prepare the subprojects.

During construction and operation

- The DWSS, through the PMO, will oversee the EARF and EMP implementation of all subprojects.
- The WSSDO, through the RPMOS, will oversee the EARF and EMP implementation at subproject/town level.

10.2 Safeguard Implementation Arrangement

Project Management Office (PMO)

123. The safeguard officers (environmental safeguard officer and social safeguard officer) of the PMO will receive support from the safeguards experts (environmental and social) of the Project Management Consultants (PMC) as specified below:

i. confirm existing IEEs/EMPs are updated based on detailed designs and that new IEEs/EMPs are prepared in accordance with the EARF and government rules;
ii. confirm whether EMPs are included in bidding documents and civil works contracts;

iii. provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by regional project management offices (Eastern RPMO and Western RPMO) and contractors;
iv. establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;
v. 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;
vi. supervise and provide guidance to the RPMOs to properly carry out the environmental monitoring and assessments as per the EARF;
vii. review, monitor and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary;
viii. consolidate monthly environmental monitoring reports from RPMOs and submit semi-annual monitoring reports to ADB;
ix. ensure timely disclosure of final IEEs/EMPs in project locations and in a form accessible to the public; and
x. address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

Regional Project Management Offices (Eastern and Western RPMOs)

124. The regional DWSS engineers and social development officers of the RPMOs will receive support from; (i) the PMO safeguards officers (environmental and social); and (ii) the safeguards specialists (environmental and social), the social mobilizes and environmental management plan (EMP) monitors of the design, supervision and management consultant (DSMC) teams as specified below:

i. prepare new IEEs/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 ina timely manner as per the IEEs.

Civil Works Contracts and Contractors

125. EMP is to be included in bidding and contract documents and verified by the PMO and RPMOSs. 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 provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities, on (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste, and on (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 sites. Contractors will only starts the civil works activities in the section/subproject sites that has IR/IPP impacts upon the completion of RP/IPP implementation and after receiving clearance from the WUSC and endorsed by RPMO's SDO.

Capacity Building

126. The PMC 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. sensitization;
ii. introduction to environment and environmental considerations in water supply and wastewater projects;

iii. review of IEEs and integration into the project detailed design;
iv. improved coordination within nodal departments; and
v. Monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to worksites.

Water Users and Sanitation Committees (WUSCs)

127. WUSCs are the eventual operators of the completed subprojects. The key tasks and responsibilities of the WUSCs are, but not limited to:

Prior to construction

- Facilitate public consultation and participation, information dissemination andsocial preparation.
- Provide available data to the DSMC-ESS during the conduct of the 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 the 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 the EMP and the Water Safety Plan.
- Regularly monitor the water quality
- Prepare the environmental monitoring report as per IEE.
- Ensure observance of the grievance redress mechanism

Licensed and accredited laboratory

128. 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.

10.3 Institutional Capacity Development Program

129. 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.

130. WUSC does not have the capacity to monitor the quality of supplied water as prescribed in the NDWQS and its Directives. Albeit monitoring kits and laboratory rooms will be provided, this would not guarantee WUSC can handle monitoring appropriately. DWSS has five regional laboratories; however some are not functioning fully due to lack of manpower. 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 the WUSC actively participating to develop WUSC capacity. The conduct of 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 capacity of the WUSC is sustained. The cost for monitoring during operation is based on the assumption that a licensed laboratory will be engaged for both the monitoring requirements and to train the WUSC. A Water Safety Plan is included in subproject 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 lab, while monitoring water quality.

131. The PMO will be responsible for trainings on environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the

requirements of the project. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply and wastewater projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites.

10.4 Staffing Requirement and Budget

132. 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.

133. The infrastructure involved in each scheme is generally straightforward to build. 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 assisted by the PMO environmental safeguard officer. Therefore, no separate budget is required for the PMO.

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

135. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of the WUSC. All monitoring during the operation and maintenance phase will be conducted by WUSC. The Water Safety Plan, included in each subproject design, will allocate NPR 500,000 annually for operation and maintenance particularly water quality monitoring. If a licensed laboratory will be engaged for the first 2-3 years of operation for training purposes, the cost can be accommodated under the Water Safety Plan.

10.5 Monitoring and Reporting

136. RPMOs 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 IEE for the projects. In addition to recording

10.6 Environmental Monitoring Mechanism

137. Under the chairmanship of Kamalamai municipality, a Monitoring Committee should be formed. The committee should be represented by the chairman of concerned service wards of the VDC, representative from environment related NGOs, local community, Water Users' Committee and local entrepreneur. Secretary of the Kamalamai municipality should act as member secretary of the Monitoring Committee. This committee should be assigned following duties and responsibilities:

- The committee should meet at least twice a month;
- The committee should collect all complaints from the local people concerning distribution, pipeline etc and should discuss in the meeting for the final decisions;
- The monitoring committee should identify the mistakes and deficiency regarding the project and should discuss in the meeting for the purpose of correction;
- Any negligence regarding the water quality should be considered and take necessary action;
- The committee should also supervise and provide instructions for activities such as:
- Distribution of qualitative water,
- Storage of water in the reservoir tanks,
- Treatment plant,
- Handling of toxic/chemical matters,
- Training for the locals, and
- Examine monitoring reports periodically and take necessary actions if required etc.

10.7 Monitoring Reporting Mechanism

138. As proposed by approved EMP, the reporting system should include site supervision and reporting as well and primarily connected with Monitoring plan. The construction contractors are

responsible for implementing approved EMP. The supervising consultants are responsible for monitoring to oversee whether or not the contractors have complied with the approved conditions as stated in EMP and also receive the monthly progress report from construction contractors. Based on this information the consulting engineers prepare the front line monitoring report and submit to DWSS for review

10.8 Monitoring cost, parameters, location and schedule

139. During rehabilitation, the cost for monitoring will be minimum and it should be allocated as and when required from the project contingency.

10.9 Contractors Compliance on EMP

140. The recommended mitigation measures are shown in the Table 10-1. The contractor should comply with the recommended mitigation activities.

10.10 Institutional Capacity Development Program

141. 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.

142. In the Table 10-1 given below, the types of impact as predicted, corresponding mitigation measures, monitoring parameters, monitoring indicators, location and sources, responsibility and frequencies of monitoring have been included. The monitoring protocols given below are based on the Environmental Management Plan (IEE Kamalamai, 2005) approved by Government of Nepal 2005.

10.11 Environmental Mitigation Cost

143. Most of the recommended mitigation measures are incorporated in the contractual obligations and constructions works to be completed by the contractors. Facilities like water treatment plant, water testing laboratory etc are also either existing or to be installed is also included in the contract. Therefore mitigation cost of the enhancement project will be negligible. However in order to strengthen the existing facilities 2% of total project cost is proposed should be allocated.

Table 10-1: Mitigation Measures and Corresponding Monitoring Plan

Impact and mitigation prescription		Monitoring plan for implementation						Status	
Environmental Impact	**Mitigation action**	**Parameter to be Monitored**	**Indicators**	**Location**	**Sources**	**Responsibility**	**Frequency**	**Previous**	**Present[2]**
Physical Environment									
Construction Phase									
Land use pattern	Acquire only required land	Change in cropping pattern	Quality and quantity of yield	Project area	Local people	WUSC	Half yearly	Completed	Not applicable
Impact due to landslide, erosion and soil instability	Proper drainage in reservoir and leakage of pipeline should be monitored regularly	Landslide and soil erosion areas	Number of landslides and soil erosion area changed	Project area	Field inspection	DSC/Contractor	After monsoon	Completed	Not significant
	The excavated material must be safely disposed.	Ensure proper management of excessive spoil materials in place	Evidence of landscape erosion and river turbidity undisturbed	Project area	Field inspection	DSC/Contractor	After monsoon	Completed	Recommended
Impacts of sediments and Disinfecting Chemicals	Safe disposal	Water quality	Chemicals and pathogen exceeding national standards	Project area	Water quality test	DSC/Contractor	Quarterly	Completed	Recommended

[2]Recommended for EMP compliance

Impact and mitigation prescription		Monitoring plan for implementation						Status	
Environmental Impact	**Mitigation action**	**Parameter to be Monitored**	**Indicators**	**Location**	**Sources**	**Responsibility**	**Frequency**	**Previous**	**Present[2]**
Water Volume/ Quality	Limited extraction/ regular testing	Measurement of River flow and underground water table level	Change in quantity	Project area	River and ground water	DSC/Contractor	Quarterly	Completed	Recommended
Air Quality	Confine earthworks according to a staking plan and excavation segmentation plan and a part of the document	Visibility due to presence of dust	Location of stock pile	Project area	Local people and surrounding environment	DSC/Contractor	Twice in a week	Completed	Recommended
		Amount of dust present in surrounding environment	Number of complaint from sensitive receptors	Project area	Local people and surrounding environment	DSC/Contractor	Twice in a week	Completed	Recommended
Acoustic environment	Restrict noisy activities to daytime. Overtime work should avoid using noisy/high noise generating	Sound intensity during day and night time	Number of complaints from sensitive receptors;	Project area	Local people and surrounding environment	DSC/Contractor	Twice in a week	Completed	Recommended

Impact and mitigation prescription		Monitoring plan for implementation						Status	
Environmental Impact	**Mitigation action**	**Parameter to be Monitored**	**Indicators**	**Location**	**Sources**	**Responsibility**	**Frequency**	**Previous**	**Present[2]**
	equipment.								
		Sound intensity at and nearby of source	Use of silencers in noise-producing equipment and sound barriers;	Project area	Local people and surrounding environment	DSC/Contractor	Twice in a week	Completed	Recommended
Traffic movement	Pipe line work need to be done during night and during less traffic time	Number of vehicles diverted	Number of vehicles movement	Project area	Local people and surrounding environment	WUSC/DSC/Contractor	During pipeline work	Completed	Recommended
Biological Environment									
Construction Phase									
Impact on natural vegetation and habitat	Construction area should be well demarked and proper instruction to be given for the workers.	Vegetation density, number and types of wild animals	Change in vegetation density and number of wild life	Project area	Project area	DSC/Contractor	Quarterly	Completed	Recommended
Socio-economic and cultural environment									
Construction Phase									
Impairment to Infrastructure	Not applicable								
Land acquisition	Project has to make sure	Compensation measures	All affected	Project area	Records and	WUSC	Yearly	Completed	Completed

Impact and mitigation prescription		Monitoring plan for implementation						Status	
Environmental Impact	**Mitigation action**	**Parameter to be Monitored**	**Indicators**	**Location**	**Sources**	**Responsibility**	**Frequency**	**Previous**	**Present[2]**
	that adequate compensation for the land acquired from private citizens (if required) is made				Interview				
Outside workforce conflict/ health/ pollution/ culture	Disease transmission, pollution and competition for the available resources to outsiders should be thoroughly checked.	Situation of social disharmony Awareness program	Decreased social disharmony Effective awareness program	Project area	Records and Interview	Contractor	Yearly	Completed	Recommended
Operation Phase									
Water right Conflict	Public taps should be established in appropriate places.	Number of public taps installed	Adequate water supply to the public	Project area	Field inspection and Interview	WUSC	Quarterly	Completed	Recommended
Workers health and safety	Comply with requirements of Labor Act of GoN and	Health of workers Dress and first-aid	Site-specific H&S Plan	Project area	Workers health statusand Interview	WUSC	Quarterly	Completed	Recommended

Impact and mitigation prescription		Monitoring plan for implementation						Status	
Environmental Impact	**Mitigation action**	**Parameter to be Monitored**	**Indicators**	**Location**	**Sources**	**Responsibility**	**Frequency**	**Previous**	**Present[2]**
	standards on workers' health and safety (H&S).	facilities stations							
	Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances	Health of workers Dress and first-aid facilities stations	Condition of sanitation facilities for workers	Project area	Workers health statusand Interview	WUSC	Quarterly	Completed	Recommended

Source: IEE Kamalamai 2005

2. Recommended for EMP compliance

Table 10-2: Mitigation Measures and Monitoring Plan for Rehabilitation Activities

Overview of Impacts		Required mitigation measures			Monitoring plan for implementation				
Project activities	**Possible impacts (on all baseline parameters)**	**Mitigation associated with project location**	**Mitigation in project design features**	**Residual mitigation measures (not addressed by location and design)**	**Parameter to be Monitored**	**Indicators**	**Location**	**Responsibility**	**Frequency**
Water source									
Intake									
Protection and maintenance	Diversion of river	Construction of check dam and gabion	Protection measures are included in drawing		River flow	River flow intensity	Site specific	Contractor	During construction
Transmission line									
Landslide stabilization work	Landslide and erosion	Construction of check dam, gabion and bioengineering works	Protection measures are included in drawing		Landslide and slope stability	Reduction in landslide and erosion	Site specific	Contractor and WUSC	During construction and operation
Pipe line change	Impact on vegetation	Removal of vegetation	Not applicable		Density of vegetation to be removed	Number of removed vegetation	Site specific	Contractor	During construction
Leakage improvement	Not significant impact								
Treatment plant									
Plain sedimentation tank	No any significant impact								
Maintenance of Horizontal	No any significant								

Overview of Impacts		Required mitigation measures			Monitoring plan for implementation				
Project activities	**Possible impacts (on all baseline parameters)**	**Mitigation associated with project location**	**Mitigation in project design features**	**Residual mitigation measures (not addressed by location and design)**	**Parameter to be Monitored**	**Indicators**	**Location**	**Responsibility**	**Frequency**
roughing filter	impact								
Media replacement of slow sand filter	Minor impact (site specific)								
Installation of chlorination unit	Excessive use may be detrimental	Avoid excessive use							
	Leakage through storage	Maintain proper storage to avoid leakage			Chlorine contamination	Health problem in local people	Site specific	WUSC	Operation
Construction of reservoir									
Construction of plain sedimentation tank, horizontal roughing and slow sand filter	Impact of excavation of earth	Proper disposal of excavated materials and use of protection measures	Location of disposal site		Inspection of disposal site	Number of Landslides and erosion created by disposal	Site specific	Contractor	During construction
	Impact on landscaping and slope	Adequate excavation in proper way/ ownership			Landslide and slope stability	Increase in landslide and erosion	Site specific	Contractor	During construction
Distribution									

Overview of Impacts		Required mitigation measures			Monitoring plan for implementation				
Project activities	**Possible impacts (on all baseline parameters)**	**Mitigation associated with project location**	**Mitigation in project design features**	**Residual mitigation measures (not addressed by location and design)**	**Parameter to be Monitored**	**Indicators**	**Location**	**Responsibility**	**Frequency**
line									
Installation of fire hydrant	Minor impact (site specific)	Traffic diversion	Not applicable				Site specific	Contractor	During construction
Network rehabilitation activities/ Additional distribution network	Traffic disturbance	Arrangement for traffic diversion with traffic	Traffic diversion		Arrangement of vehicular movement during construction	Smooth running of vehicles through diversion	Site specific	Contractor	During construction
	Air pollution	Dust reduction should be controlled	Not applicable		Air quality	Particulate matter in air	Site specific	Contractor, WUSC and Locals	During construction
	HHs water distribution	Intermittent supply	Supply water through other sources		Water supply continued	Adequate amount of water supply in each households	Site specific	Contractor and WUSC	During construction

Note: Table 10-2 is prepared according to Table 7-1 of Chapter 7.

11. CONCLUSIONS AND RECOMMENDATIONS

144. The proposed subproject is not an environmentally critical undertaking. The IEE indicates that:

- The proposed subproject, its components, are not within or adjacent to environmentally sensitive areas.
- The extent of adverse impacts is expected to be local, confined within the subprojects' main areas of influence, quarry or borrowing sites, waste disposal sites, and the routes to and from these sites. Fine aggregates, sediments and/or wastes would not be the transported beyond the aforementioned sites. With mitigation measures in place and ensuring that the bulk of earthworks are completed prior to the onset of the rainy season, the potential adverse impacts during construction would be highly/more site-specific.
- 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 period). These will not be sufficient to threaten or weaken the surrounding resources. The preparation and implementation of a Contractor's EMP that would address as minimum the requirements of the SPS-compliant subproject EMP will mitigate the impacts and lower their residual significance to acceptable levels. Simple/uncomplicated mitigation measures, basically integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are known to Contractors. Hence, mitigation measures would not be difficult to design and institute.
- During operation, the potential delivery of unsafe water can be mitigated with good operation and maintenance, prompt action on leaks, and complying with the required quality monitoring of supplied water as prescribed in the National Drinking Water Quality Standards Directives.
- The proposed subproject will bring about: (i) the benefits of access to reliable supply of safe and potable water; (ii) promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts; and (iii) enhanced public health, improved quality of life and safe communities as outcomes.

145. Based on the above findings, the classification of the 3rdSTWSSSP as Category B is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with the Safeguard Policy Statement of the ADB. The Government of Nepal will incorporate the findings and recommendations of this IEE and prescribed environmental management in the EMP.

12. COMMENTS INCORPORATION MATRIX

Annexes

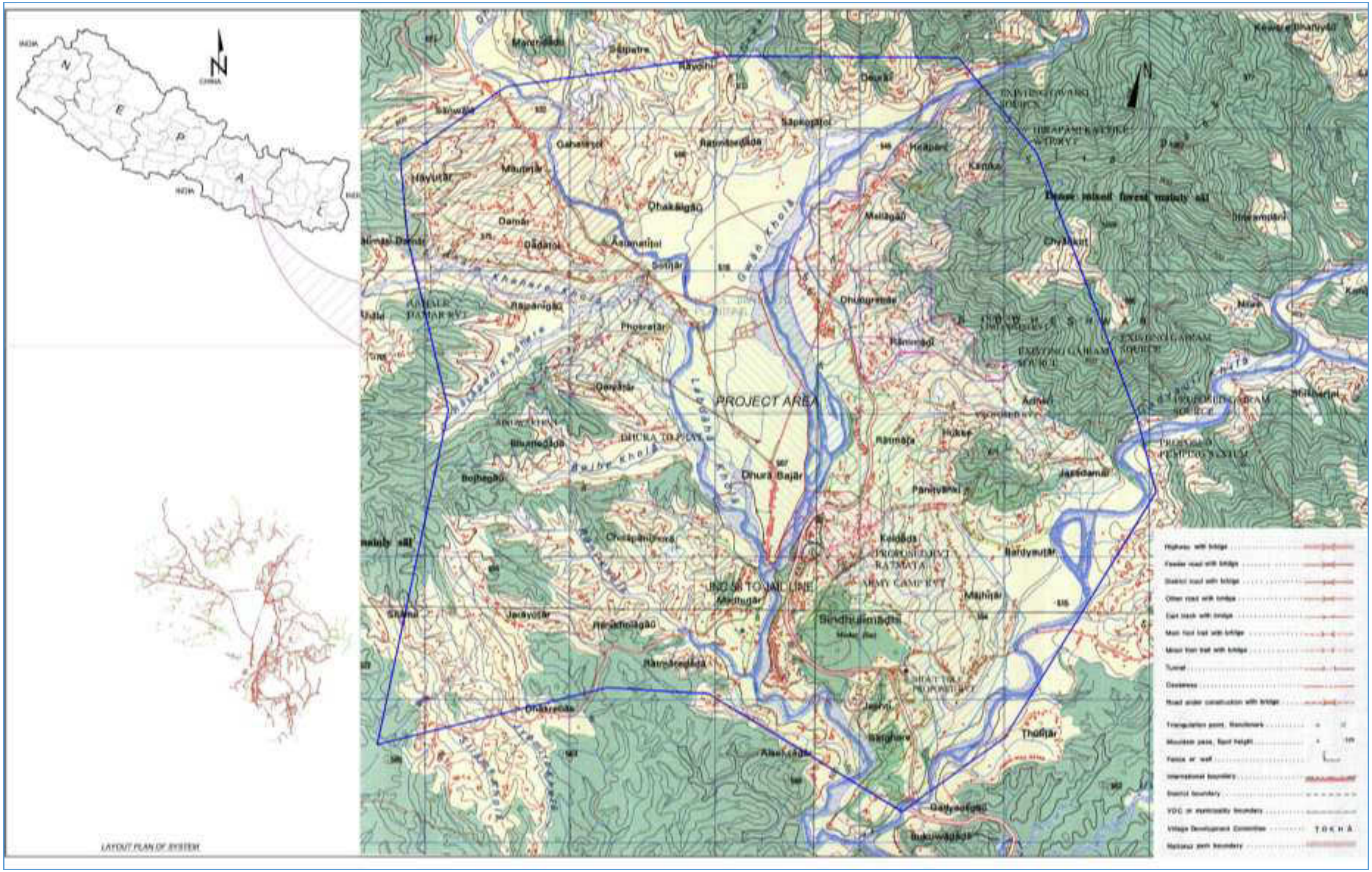
Annex 1: Project Location Map and Water Supply Plan

Annex 2: Water Tested Laboratory Analysis Report

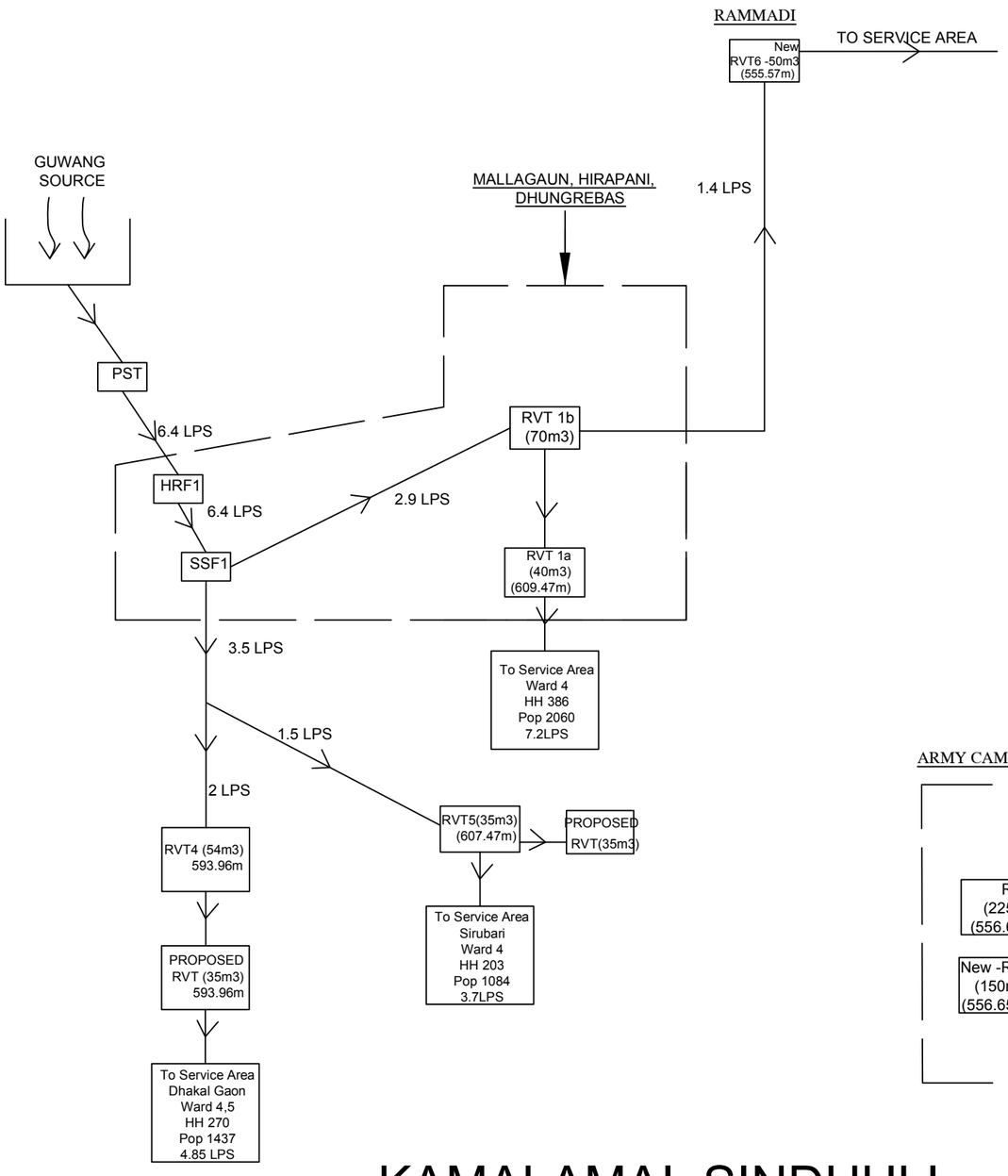
Annex 3: Rapid Environmental Assessment (REA) Checklist

Annex 4: Minute of Meeting

Annex 1: Project Location Map and Water Supply Plan

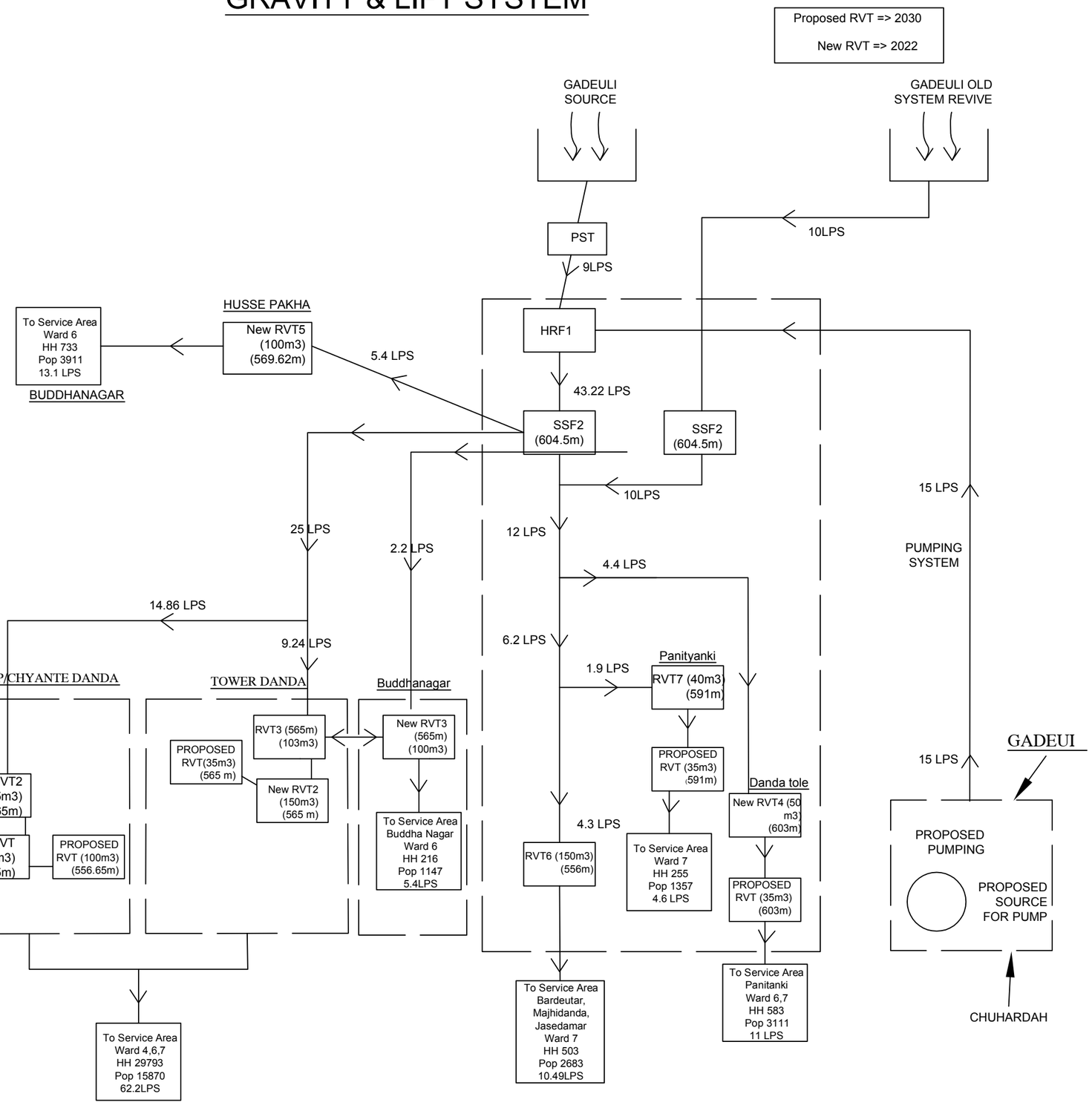

NEPAL
PROJECT AREA
Labdaha Khola
Gwan Khola
Dhurā Bajār
Sindhulimādi
Hayutār
Damār
Ahal Tar
Kankai
Thoklār
Dense mixed forest mainly sāl
LAYOUT PLAN OF SYSTEM

GRAVITY SYSTEM



KAMALAMAI, SINDHULI

GRAVITY & LIFT SYSTEM



Annex - 2: Water Tested Laboratory Analysis Report

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LABORATORY ANALYSIS REPORT

Name of Sender: SILT ITEKO UNICORN JV	Name of the Project: Kamdunai STWSSSP	Date of Collection: 20/9/2014
Sample No: 727/071/072	Type of Source: River	No of Sample: 1
Date of Receipt: 21/9/2014	Name of the Source: Gadyoulli Muhan	Field Temperature: 24.5 °C
Analyzed Date: 21-31/9/2014	Sampling Point: Roughing Filter (RF) Inlet	Field pH: 7.2
Sampled by: WETC	Location: Kamdunai	Field EC: 76.8 μS/cm

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
PHYSICAL					
pH		6.5-8.5	6.5-8.5*	7.2	4500-H B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	1.0	2130 B, APHA, 21ST EDITION
Electrical Conductivity	uS/cm	-	1500	80	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	24.9	2550 B, APHA, 21ST EDITION
CHEMICAL					
Calcium	mg/l as Ca^{2+}	-	200	11.2	3500 - Ca B, APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	1.9	3500-Mg B, APHA, 21ST EDITION
Iron	mg/l as Fe^{2+}	0.3	0.3(3)	0.18	3111 B, APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	<0.01	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	<0.005	3114 C APHA, 21ST EDITION
Ammonia	mg/l as NH_4^+	1.5	1.5	0.07	4500-NH3C, APHA, 17TH EDITION
Sodium	mg/l as Na^+	-	-	3.1	3111 B, APHA, 21ST EDITION
Potassium	mg/l as K^+	-	-	1.2	3111 B, APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{6+}	0.05	0.05	<0.01	3111 B, APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	34	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^-	-	-	Nil	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	34	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	Nil	2320 B, APHA, 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	34	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	0.08	4500-P E, APHA, 21ST EDITION
Nitrate	mg/l as NO_3^-	50	50	0.03	4500-NO3- B., APHA, 21ST EDITION
Nitrite	mg/l as NO_2	3	-	<0.02	4500-NO2- B., APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	<5.0	4500-SO4, APHA, 21ST EDITION
Chloride	mg/l as Cl	250	250	0.99	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F^-	-	-	20.6	4500F- D, APHA, 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	0.55	4500-SiO2 D, APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	36	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	34	Calculation
Total Dissolved Solid	mg/l	1000	-	40	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	-2.02	2330 B, APHA, 21ST EDITION
BIOLOGICAL					
Total Coliform	CFU/100 ml	Nil	Nil	300	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	100	9222 D., APHA, 21ST EDITION

APHA: American Public Health Association, Standard Methods for the Examination of Water Waste Water, WHO GV: World Health Organization Guideline Value, 2006 Update NDWQS National Drinking Water Quality Standard, 2062 (Nepal), * These values show lower and upper limits, () Values in the parenthesis refers the acceptable values only when alternative is not available **Not accredited Test Method

Comment: ***Biological contaminated.***

Analyzed by | Checked by | Authorized Signature

Note. 1. The result refer only to the parameters tested of the samples provided to our laboratory or collected by us for analysis as specified. Endorsement of the product is neither inferred nor implied.
2. Any duplication of this report can not be used as evidence in the court of law and should not be used in any advertising media without prior written permission to us.
3. The total liability of our company for the project is limited to the invoiced amount only.

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LABORATORY ANALYSIS REPORT

Name of Sender: **SILT TEKO UNICORN JV**
Sample No: **728/071/072**
Date of Receipt: **21/9/2014**
Analyzed Date: **21-31/9/2014**
Sampled by: **WETC**

Name of the Project: **Kamalamai SIWSSSP**
Type of Source: **River**
Name of the Source: **Gadyoulli Mahan**
Sampling Point: **SSF Outlet**
Location: **Kamalamai**

Date of Collection: **20/9/2014**
No of Sample: **1**
Field Temperature: **25** °C
Field pH: **8.3**
Field EC: **87.6** µS/cm

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
PHYSICAL					
pH	-	6.5-8.5	6.5-8.5*	7.4	4500 H+ B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	<1.0	2130 B, APHA, 21ST EDITION
Electrical Conductivity	uS/cm	-	1500	84	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	24.9	2550 B, APHA, 21ST EDITION
CHEMICAL					
Calcium	mg/l as Ca^{2+}	-	200	9.6	3500 - Ca B. APHA. 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	2.4	3500-Mg B. APHA, 21ST EDITION
Iron	mg/l as Fe^{2+}	0.3	0.3(3)	0.05	3111 B. APHA. 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	<0.01	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	<0.005	3114 C,APHA, 21ST EDITION
Ammonia	mg/l as NH_4^+	1.5	1.5	<0.02	4500-NH3C., APHA, 17TH EDITION
Sodium	mg/l as Na^+	-	-	3.7	3111 B. APHA, 21ST EDITION
Potassium	mg/l as K^+	-	-	1.3	3111 B. APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{3+}	0.05	0.05	<0.01	3111 B. APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	42	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^-	-	-	Nil	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	42	2320 B. APHA. 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	Nil	2320 B. APHA. 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	42	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	0.07	4500-P E. APHA, 21ST EDITION
Nitrate	mg/l as NO_3^-	50	50	0.14	4500-NO3- B , APHA, 21ST EDITION
Nitrite	mg/l as NO_2^-	3	-	<0.02	4500-NO2- B , APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	<5.0	4500-SO4. APHA, 21ST EDITION
Chloride	mg/l as Cl	250	250	<0.8	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F	-	-	19.7	4500F- D. APHA, 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	0.22	4500-SiO2 D. APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	34	2340 C. APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	42	Calculation
Total Dissolved Solid	mg/l	1000	-	42	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	-1.7	2330 B, APHA, 21ST EDITION
BIOLOGICAL					
Total Coliform	CFU/100 ml	Nil	Nil	>300	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	132	9222 D., APHA, 21ST EDITION

APHA. American Public Health Association, Standard Methods for the Examination of Water Waste Water, WHO GV: World Health Organization Guideline Value, 2006 Update, NDWQS. National Drinking Water Quality Standard, 2062 (Nepal), * These values show lower and upper limits, () Values in the parenthesis refers the acceptable values only when alternative is not available **Not accredited Test Method

Comment: ***Biological contaminated.***

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LABORATORY ANALYSIS REPORT

Name of Sender: SILT TEKO UNICORN JV
Sample No: 729/071/072
Date of Receipt: 21/9/2014
Analyzed Date: 21/31/9/2014
Sampled by: WETC

Name of the Project: Kamalamai STWSSP
Type of Source: River
Name of the Source: Gadyaulli Mohan
Sampling Point: Private Tap
Location: Kamalamai

Date of Collection: 20/9/2014
No of Sample: 1
Field Temperature: 25.7 °C
Field pH: 7.4
Field EC: 89.2 µS/cm

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
PHYSICAL					
pH	-	6.5-8.5	6.5-8.5*	7.4	4500-H+ B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	<1.0	2130 B, APHA, 21ST EDITION
Electrical Conductivity	µS/cm	-	1500	87	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	24.9	2550 B, APHA, 21ST EDITION
CHEMICAL					
Calcium	mg/l as Ca^{2+}	-	200	7.2	3500 - Ca B. APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	4.4	3500-Mg B. APHA, 21ST EDITION
Iron	mg/l as Fe^{2+}	0.3	0.3(3)	0.08	3111 B, APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	<0.01	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	<0.005	3114 C,APHA, 21ST EDITION
Amanonia	mg/l as NH_4^+	1.5	1.5	0.11	4500-NH3 C, APHA, 17TH EDITION
Sodium	mg/l as Na^+	-	-	3.6	3111 B. APHA, 21ST EDITION
Potassium	mg/l as K^+	-	-	1.2	3111 B. APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{3+}	0.05	0.05	<0.01	3111 B. APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	38	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^-	-	-	Nil	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	38	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	Nil	2320 B, APHA, 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	38	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	0.13	4500-P E. APHA, 21ST EDITION
Nitrate	mg/l as NO_3^-	50	50	0.56	4500-NO3- B., APHA, 21ST EDITION
Nitrite	mg/l as NO_2^-	3	-	<0.02	4500-NO2- B , APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	<5.0	4500-SO4. APHA, 21ST EDITION
Chloride	mg/l as Cl^-	250	250	2.9	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F^-	-	-	18.9	4500F- D. APHA. 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	0.23	4500-SiO2 D. APHA. 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	36	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	38	Calculation
Total Dissolved Solid	mg/l	1000	-	43	2540 C., APHA. 21ST EDITION
Langlier Saturation Index	-	-	-	-1.7	2330 B. APHA, 21ST EDITION
BIOLOGICAL					
Total Coliform	CFU/100 ml	Nil	Nil	1	9222 B. APHA, 21ST EDITION
Fecal Colform	CFU/100 ml	Nil	Nil	Nil	9222 D., APHA, 21ST EDITION

APHA: American Public Health Association, Standard Methods for the Examination of Water Waste Water, WHO GV: World Health Organization Guideline Value, 2006 Update, NDWQS: National Drinking Water Quality Standard, 2062 (Nepal). * These values show lower and upper limits, () Values in the parenthesis refers the acceptable values only when alternative is not available. **Not accredited Test Method

Comment: ***Biological contaminated.***

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Checked by

Authorized Signature

Note: 1. The result refers only to the parameters tested of the samples provided to our laboratory or collected by us for analysis as specified. Endorsement of the product / method tested is not given.
2. Any duplication of this report can not be used as evidence in the court of law and should not be used for any advertising media without prior written permission to us.
3. The liability of our company for the product is limited to the invoiced amount only.

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Water

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Laboratory, R & D on Total Water Management, Treatment & Consultancy

LABORATORY ANALYSIS REPORT

Name of Sender: **SILT ITEKO CNICORN JV**
Sample No: **730/071/072**
Date of Receipt: **21/9/2014**
Analyzed Date: **21-31/9/2014**
Sampled by: **WETC**

Name of the Project: **Kamalamai STWSSSP**
Type of Source: **River**
Name of the Source: **Gwang Khola**
Sampling Point: **RF Inlet**
Location: **Kamalamai**

Date of Collection: **20/9/2014**
No of Sample: **1**
Field Temperature: **24.6 °C**
Field pH: **7.3**
Field EC: **108.9 µS/cm**

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
PHYSICAL					
pH	-	6.5-8.5	6.5-8.5*	**7.3**	4500-H+ B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	**<1.0**	2130 B, APHA, 21ST EDITION
Electrical Conductivity	µS/cm	-	1500	**112**	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	**24.9**	2550 B, APHA, 21ST EDITION
CHEMICAL					
Calcium	mg/l as Ca^{2+}	-	200	**16.0**	3500 - Ca B, APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	**2.9**	3500-Mg B, APHA, 21ST EDITION
Iron	mg/l as Fe^{2+}	0.3	0.3(3)	**0.07**	3111 B, APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	**<0.01**	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	**<0.005**	3114 C,APHA, 21ST EDITION
Ammonia	mg/l as NH_4^+	1.5	1.5	**0.09**	4500-NH3C., APHA, 17TH EDITION
Sodium	mg/l as Na^+	-	-	**3.2**	3111 B, APHA, 21ST EDITION
Potassium	mg/l as K^+	-	-	**1.6**	3111 B, APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{3+}	0.05	0.05	**<0.01**	3111 B, APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	**52**	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^-	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	**52**	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	**52**	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	**0.10**	4500-P E, APHA, 21ST EDITION
Nitrate	mg/l as NO_3^-	50	50	**0.85**	4500-NO3- B., APHA, 21ST EDITION
Nitrite	mg/l as NO_2^-	3	-	**<0.02**	4500-NO2- B., APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	**<5.0**	4500-SO4, APHA, 21ST EDITION
Chloride	mg/l as Cl^-	250	250	**<0.8**	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F^-	-	-	**18.3**	4500F- D, APHA, 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	**0.23**	4500-SiO2 D, APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	**52**	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	**52**	Calculation
Total Dissolved Solid	mg/l	1000	-	**56**	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	**-1.4**	2330 B, APHA, 21ST EDITION
BIOLOGICAL					
Total Coliform	CFU/100 ml	Nil	Nil	**200**	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	**66**	9222 D., APHA, 21ST EDITION

APHA: American Public Health Association, Standard Methods for the Examination of Water Waste Water, WHO GV: World Health Organization Guideline Value, 2006 Update, NDWQS: National Drinking Water Quality Standard, 2062 (Nepal), * These values show lower and upper limits, () Values in the parenthesis refers the acceptable values only when alternative is not available. **Not accredited Test Method

Comment: ***Biological contaminated.***

Analyzed By

Checked by

Authorized Signature

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LABORATORY ANALYSIS REPORT

Name of Sender: **SILT ITEKO UNICORN JV**
Sample No. **731/071/072**
Date of Receipt: **21/9/2014**
Analyzed Date: **21-31/9/2014**
Sampled by: **WETC**

Name of the Project **Kamalamai STWSSSP**
Type of Source: **River**
Name of the Source: **Gwang Khola**
Sampling Point: **SSF Outlet**
Location. **Kamalamai**

Date of Collection **20/9/2014**
No of Sample. 1
Field Temperature. 24.7 °C
Field pH: 7.3
Field EC: 107.0 µS/cm

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
PHYSICAL					
pH	-	6.5-8.5	6.5-8.5*	**7.5**	4500-H+ B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	**<1.0**	2130 B, APHA, 21ST EDITION
Electrical Conductivity	µS/cm	-	1500	**114**	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	**25.0**	2550 B, APHA, 21ST EDITION
CHEMICAL					
Calcium	mg/l as Ca^{2+}	-	200	**14.4**	3500 - Ca B, APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	**3.9**	3500-Mg B, APHA, 21ST EDITION
Iron	mg/l as Fe^{3+}	0.3	0.3(3)	**0.08**	3111 B, APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	**<0.01**	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	**<0.005**	3114 C, APHA, 21ST EDITION
Ammonia	mg/l as NH_4^+	1.5	1.5	**0.05**	4500-NH3C., APHA, 17TH EDITION
Sodium	mg/l as Na^+	-	-	**3.1**	3111 B, APHA, 21ST EDITION
Potassium	mg/l as K^+	-	-	**1.6**	3111 B, APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{6+}	0.05	0.05	**<0.01**	3111 B, APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	**50**	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^-	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	**50**	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	**Nil**	2320 B, APHA, 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	**50**	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	**0.12**	4500-P E, APHA, 21ST EDITION
Nitrate	mg/l as NO_3^-	50	50	**0.84**	4500-NO3- B., APHA, 21ST EDITION
Nitrite	mg/l as NO_2^-	3	-	**<0.02**	4500-NO2- B., APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	**<5.0**	4500-SO4, APHA, 21ST EDITION
Chloride	mg/l as Cl^-	250	250	**<0.8**	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F^-	-	-	**16.0**	4500F- D, APHA, 21ST EDITION
Flouride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	**0.18**	4500-SiO2 D, APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	**53**	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	**50**	Calculation
Total Dissolved Solid	mg/l	1000	-	**57**	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	**-1.5**	2330 B, APHA, 21ST EDITION
BIOLOGICAL					
Total Coliform	CFU/100 ml	Nil	Nil	**200**	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	**47**	9222 D., APHA, 21ST EDITION

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Comment: ***Biological contaminated.***

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LABORATORY ANALYSIS REPORT

Name of Sender: SILT ITEKO UNICORN JV
Sample No. 732/071/072
Date of Receipt: 21/9/2014
Analyzed Date: 21-31/9/2014
Sampled by: WETC

Name of the Project: Kamalamai STWSSSP
Type of Source: Mul
Name of the Source: Spring Source (Inside Sisnu ghari)
Sampling Point: Mul
Location: Kamalamai

Date of Collection: 20/9/2014
No of Sample: 1
Field Temperature: 23.8 °C
Field pH: 7.7
Field EC: 163.0 µS/cm

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
		PHYSICAL			
pH	-	6.5-8.5	6.5-8.5*	7.4	4500-H+ B, APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	<1.0	2130 B, APHA, 21ST EDITION
Electrical Conductivity	µS/cm	-	1500	115	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	25.0	2550 B, APHA, 21ST EDITION
		CHEMICAL			
Calcium	mg/l as Ca^{2+}	-	200	11.2	3500 - Ca B, APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	6.3	3500-Mg B, APHA, 21ST EDITION
Iron	mg/l as Fe^{+}	0.3	0.3(3)	0.03	3111 B, APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	<0.01	3111 B, APHA, 21ST EDITION
Arsenic	mg/l as As^{+}	0.01	0.05	<0.005	3114 C, APHA, 21ST EDITION
Ammonia	mg/l as NH_4^{+}	1.5	1.5	0.10	4500-NH3C., APHA, 17TH EDITION
Sodium	mg/l as Na^{+}	-	-	3.1	3111 B, APHA, 21ST EDITION
Potassium	mg/l as K^{+}	-	-	1.5	3111 B, APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{+}	0.05	0.05	<0.01	3111 B, APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	56	2320 B, APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^{-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	56	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	Nil	2320 B, APHA, 21ST EDITION
Non-carboante Alkalinity	mg/l as $CaCO_3$	-	-	56	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	0.11	4500-P E, APHA, 21ST EDITION
Nitrate	mg/l as NO_3^{-}	50	50	0.84	4500-NO3- B., APHA, 21ST EDITION
Nitrite	mg/l as NO_2^{-}	3	-	<0.02	4500-NO2- B., APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	<5.0	4500-SO4, APHA, 21ST EDITION
Chloride	mg/l as Cl^{-}	250	250	0.99	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F^{-}	-	-	16.9	4500F- D, APHA, 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	0.26	4500-SiO2 D, APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	54	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	56	Calculation
Total Dissolved Solid	mg/l	1000	-	57	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	-1.52	2330 B, APHA, 21ST EDITION
		BIOLOGICAL			
Total Coliform	CFU/100 ml	Nil	Nil	300	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	80	9222 D., APHA, 21ST EDITION

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Comment: *Biological contaminated.*

Analyzed by   Checked by   Authorized Signature

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LABORATORY ANALYSIS REPORT

Name of Sender: **SJLT ITEKO UNICORN JV** | Name of the Project: **Kamalamai SIWSSSP** | Date of Collection: **20/9/2014**

Sample No: **733/071/072** | Type of Source: **River** | No of Sample: **1**

Date of Receipt: **21/9/2014** | Name of the Source: **Gwang Khola** | Field Temperature: **24.6 °C**

Analyzed Date: **21-31/9/2014** | Sampling Point: **SSF Inlet** | Field pH: **7.3**

Sampled by: **WETC** | Location: **Kamalamai** | Field EC: **111.0 µS/cm**

Parameters	Units	WHO GV	NDWQS	Result	Methods Used
		PHYSICAL			
pH	-	6.5-8.5	6.5-8.5*	7.3	4500-H+ B. APHA, 21ST EDITION
Turbidity	NTU	5	5(10)	<1.0	2130 B, APHA, 21ST EDITION
Electrical Conductivity	uS/cm	-	1500	82	2510 B, APHA, 21ST EDITION
Lab Temperature	°C	-	-	25.0	2550 B, APHA, 21ST EDITION
		CHEMICAL			
Calcium	mg/l as Ca^{+}	-	200	8.8	3500 - Ca B. APHA, 21ST EDITION
Magnesium	mg/l as Mg^{2+}	-	-	3.9	3500-Mg B. APHA, 21ST EDITION
Iron	mg/l as Fe^{2+}	0.3	0.3(3)	0.07	3111 B. APHA, 21ST EDITION
Manganese	mg/l as Mn^{2+}	0.4	0.2	<0.01	3111 B. APHA, 21ST EDITION
Arsenic	mg/l as As^{3+}	0.01	0.05	<0.005	3114 C,APHA, 21ST EDITION
Ammonia	mg/l as NH_4^{+}	1.5	1.5	0.06	4500-NH3C., APHA, 17TH EDITION
Sodium	mg/l as Na^{+}	-	-	3.9	3111 B. APHA, 21ST EDITION
Potassium	mg/l as K^{+}	-	-	1.1	3111 B. APHA, 21ST EDITION
Total Chromium	mg/l as Cr^{3+}	0.05	0.05	<0.01	3111 B. APHA, 21ST EDITION
Bicarbonate	mg/l as $CaCO_3$	-	-	36	2320 B. APHA, 21ST EDITION
Carbonate	mg/l as CO_3^{2-}	-	-	Nil	2320 B, APHA, 21ST EDITION
Hydroxide Alkalinity	mg/l as OH^{-}	-	-	Nil	2320 B. APHA, 21ST EDITION
Total Alkalinity	mg/l as $CaCO_3$	500	-	36	2320 B, APHA, 21ST EDITION
Carbonate Alkalinity	mg/l as $CaCO_3$	-	-	Nil	2320 B, APHA, 21ST EDITION
Non-carbonate Alkalinity	mg/l as $CaCO_3$	-	-	36	2320 B, APHA, 21ST EDITION
Phosphate	mg/l as P	-	-	0.09	4500-P E. APHA, 21ST EDITION
Nitrate	mg/l as NO_3^{-}	50	50	0.19	4500-NO3- B , APHA, 21ST EDITION
Nitrite	mg/l as NO_2^{-}	3	-	<0.02	4500-NO2- B , APHA, 21ST EDITION
Sulfate	mg/l as SO_4^{2-}	250	250	<5.0	4500-SO4, APHA, 21ST EDITION
Chloride	mg/l as Cl	250	250	0.99	4500-Cl- B, APHA, 21ST EDITION
Silica	mg/l as F	-	-	16.3	4500F- D, APHA, 21ST EDITION
Fluoride	mg/l as SiO_2^{2-}	1.5	0.5-1.5*	0.09	4500-SiO2 D, APHA, 21ST EDITION
Total Hardness	mg/l as $CaCO_3$	500	500	38	2340 C, APHA, 21ST EDITION
Non Carbonate Hardness	mg/l as $CaCO_3$	-	-	36	Calculation
Total Dissolved Solid	mg/l	1000	-	61	2540 C., APHA, 21ST EDITION
Langlier Saturation Index	-	-	-	-1.6	2330 B, APHA, 21ST EDITION
		BIOLOGICAL			
Total Coliform	CFU/100 ml	Nil	Nil	310	9222 B, APHA, 21ST EDITION
Fecal Coliform	CFU/100 ml	Nil	Nil	68	9222 D., APHA, 21ST EDITION

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Comment: *Biological contaminated.*

Analyzed by | Checked by | Authorized Signature

Annex - 3: Rapid Environment Assessment (REA) Checklist

ADB'S REA Checklist

Rapid Environmental Assessment (REA) Checklist **WATER SUPPLY**

Instructions:

- ☐ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ☐ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ☐ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) Involuntary resettlement,(ii) Indigenous peoples planning, (iii) Poverty reduction, (iv) Participation, and (v) Gender and development.
- ☐ 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: **Kamalamai Small Town Water Supply Rehabilitation Sub-Project, Sindhuli**

Sector Division: **Water Supply**

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area…			
• Densely populated?	☐	☑	
• Heavy with development activities?	☐	☑	Major occupation is agriculture
• Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	☐	☑	The subproject components are not within locations in or near sensitive and vulnerable ecosystems and protected areas.
• 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?	☐	☑	Groundwater sourced from deep tube wells will be the source for the water supply system. Further, the project has prescribed design criteria that no sanitation facility (toilets, septic tanks and septage disposal/ management pits) will be located within a 30m buffer upstream of groundwater extraction sites.
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	☑	Not present
• Hazard of land subsidence caused by excessive ground water pumping?	☐	☑	Reservoir formation, Guwang and Gadeuli stream (Perennial)

SCREENING QUESTIONS	Yes	No	REMARKS
• Social conflicts arising from displacement of communities?	☐	☑	Not anticipated. The proposed sites of the deep tube well and new overhead tank will not require acquisition of private land. There are no encroachers/squatters or residential/commercial structures at the proposed sites where infrastructure is to be established.
• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?	☐	☑	Not anticipated. Water quantity is sufficient.
• Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	☑	☐	Arsenic problem occurs in the area, a health hazard
• Delivery of unsafe water to distribution system?	☑	☐	Can be mitigated
• Inadequate protection of intake works or wells, leading to pollution of water supply?	☑	☐	Can be mitigated
• Over pumping of ground water, leading to salinization and ground subsidence?	☐	☑	High cost involved in pumping will constrain over pumping. EMP recommends monitoring pumping & maintaining record to control pumping to design limit.
• Excessive algal growth in storage reservoir?	☑	☐	Treatment will come in existence
• Increase in production of sewage beyond capabilities of community facilities?	☑	☐	Can be mitigated
• Inadequate disposal of sludge from water treatment plants?	☑	☐	Can be mitigated
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	☐	☑	Groundwater pumps are submersible and all other pump equipment in the water treatment plan will be housed in a pump shed.
• Impairments associated with transmission lines and access roads?	☑	☐	Minor and temporary impact
• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	☑	☐	To be consider in design stage
• Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?	☑	☐	Training for operator to be provided
• Dislocation or involuntary resettlement of people	☐	☑	Not anticipated
• Social conflicts between construction workers from other areas and community workers?	☑	☐	Minor and temporary impact
• Noise and dust from construction activities?	☑	☐	Minor and temporary impact
• Increased road traffic due to interference of construction activities?	☑	☐	Minor and temporary impact
• Continuing soil erosion/silt runoff from construction operations?	☑	☐	Minor and temporary impact
• 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?	☑	☐	Training for operator to be provided

SCREENING QUESTIONS	Yes	No	REMARKS
• Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?	☐	☑	Concern for corrosion of G.I. pipes caused by the chlorine content in treated water is low. EMP provides mitigation measures.
• Accidental leakage of chlorine gas?	☐	☑	Bleaching power is used in Nepal
• Excessive abstraction of water affecting downstream water users?	☐	☑	Not applicable
• Competing uses of water?	☐	☑	Not applicable
• Increased sewage flow due to increased water supply	☑	☐	Frequency of septage pumping to be increased; regular testing of ground water for microbiological pollution
• Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	☑	☐	Can be mitigated and improved
• Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	☐	☑	Its small project, so limited number of worker will increase, and can be managed
• Social conflicts if workers from other regions or countries are hired?	☐	☑	Priority in employment will be given to local residents.
• Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?	☐	☑	Minor and temporary impact
• Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	☐	☑	Minor and temporary impact
Sanitation			
C. Potential environmental impacts Will the project cause…			
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	☑	No such areas near the subproject sites.
• Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	☐	☑	Minor and temporary impact
• Dislocation or involuntary resettlement of people?	☐	☑	Not applicable
• Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?	☐	☑	Not applicable
• Impairment of downstream water quality due to inadequate Sewage treatment or release of untreated sewage?	☐	☑	Toilets will be connected to septic tanks that will be designed to achieve maximum retention.
• Overflows and flooding of neighboring properties with raw sewage?	☐	☑	Not applicable
• Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	☐	☑	Minor and temporary impact
• Noise and vibration due to blasting and other civil works?	☑	☐	Minor and temporary impact

SCREENING QUESTIONS	Yes	No	REMARKS
• Risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	☐	☑	Minor and temporary impact
• Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐	☑	Minor and temporary impact
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	☐	☑	Minor and temporary impact
• Road blocking and temporary flooding due to land excavation during the rainy season?	☑	☐	Not applicable as construction work will be done during off rainy seasons
• Noise and dust from construction activities?	☑	☐	Minor and temporary impact
• Traffic disturbances due to construction material transport and wastes?	☑	☐	Minor and temporary impact
• Temporary silt runoff due to construction?	☑	☐	Not applicable
• Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	☐	☑	Minor and temporary impact
• Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	☐	☑	Not applicable
• Contamination of surface and ground waters due to sludge disposal on land?	☐	☑	Not applicable
• Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unsterilized sludge?	☐	☑	Not applicable
• Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?	☐	☑	Not applicable
• Social conflicts between construction workers from other areas and community workers?	☐	☑	Priority in employment will be given to local residents.
• Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	☐	☑	Not applicable.
• Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	☐	☑	Minor and temporary impact

Annex - 4: Minute of Meeting

English Translation of Minute of Meeting - Phase II

Kamalamai Small Town Water Supply Sanitation and User's Committee organized a public hearing workshop on 2072/6/8. Participation were made from all concerned stakeholders. After discussion in the public hearing it was observed that there will be no negative impacts on the environment, no necessity of land acquisition and no need of resettlement while implementing the proposed "Enhance Functionality" in Small Town Water Supply and Sanitation Sector Project. As such it was decided to inform this conclusion to the concerned authorities.

Phase 1

Kamalamai

आज मिति २०७२।३।२८ गते सिद्धेश्वर स्वावलम्बी खानेपानी तथा सरसफाई उपभोक्ता संस्थाका अध्यक्ष श्री महेन्द्रदेव खोपा को अध्यक्षता र डैकेको नेपालका प्रतिनिधि श्री राहुल कुमार हकुरीको विशेष उपस्थितिमा बैठक बसी निम्न प्रस्तावहरुमाथि छलफल गरी निर्णय गरियो।

उपस्थिति कार्य समिति:

अध्यक्ष श्री महेन्द्रदेव खोपा

उपाध्यक्ष श्री - गीता थापा

सचिव - श्री - ओम प्रकाश खोपा

कोषाध्यक्ष श्री - सुरज मिश्र

सदस्य श्री महेश्वर न्यौपाने

सदस्य श्री लोकबिक्रम थापा

सदस्य - श्री उत्पल खड्का

सल्लाहकार श्री होमु खोपा

सदस्य श्री कमला कोइराला

आमन्त्रित विशेष उपस्थिति - राहुल कुमार हकुरी डैकेनेपाल

प्रस्तावहरु:

१) पुन निर्माण सहयोग कार्यक्रम सम्बन्धमा।

२) पुरा गर्नु पर्ने मापदण्डको सम्बन्धमा।

३) विविध सम्बन्धमा।

निर्णयहरु: निर्णय नं. १: पुन निर्माण सहयोग कार्यक्रम सम्बन्धमा माथि छलफल गर्दा यस सिद्धेश्वर उपभोक्ता संस्थाको नयाँ कार्य समिति चयन भए देखि हाल संस्थाले व्यवस्थापकिय रुपमागत निकाय मा कार्य संचालनमा सुधार भएको छ। हाल पहिलेको स्टाटेट अनुसारको आवेदन पत्र पानी तथा सरसफाई धर-धरी सरसफाई साल भर। धेरै पनि बढि भएको र हाल ८ घर धरधुरी रहेकोलाई पनि प्रति दिन ५ घण्टा पानी दिन सकेको छ। थप गर्नु पर्ने र तालिम अनुसारको कार्य गर्नु पर्ने भएको हुदा कार्य समितिको नविकरण र सबैको निरन्तर रहेको छ।

नगरपालिकाको कोष (रु ३.९)लाई अनुरोध गर्ने अर्थसमितिसँग निर्णय गरिने गरियो।

नगरपालिका:

१। पानीको स्रोत काम गर्नुपर्ने:

१) गुरुकर्ण खानेपानी सुधार (गोठेनी) का.न.पा–८

२) पानीट्याङ्की दमार (बोरिङ) का.न.पा–६, ८

३) [illegible] पानी भल्लागाउँ का.न.पा. ३

४) [illegible] ग्राम बोरिङ का.न.पा–६

५) [illegible] ग्राम बोरिङ का.न.पा.–६

६) [illegible] ग्राम बोरिङ बाहेक अरुलाई फिल्टर ट्याङ्की नभएकाले तिनको पहिलेको फिल्टर ट्याङ्कीले काम दिने।

२। ट्याङ्की निर्माण (खरट्याङ्की)

१) [illegible] पक्की ट्याङ्की निर्माण का.न.पा ६– १ लाख लि.

२) सावर डाँडा–रानीमाटा २ लाख ली का.न.पा–६.

३) पानीट्याङ्की दमार २ लाख ली का.न.पा–६.

४) गुरुनगर चोक– १ लाख ली का.न.पा–८.

५) जरेबार १ लाख ली का.न.पा.–६.

६) रानीमाटी रानीमाटा १ लाख लि का.न.पा–३

७) [illegible] [illegible] २ लाख ली का.न.पा.–६

३। मर्मत संभार गर्नुपर्ने:

१। पूर्वी साइड गोठेनी, मझौला फिल्टर ट्याङ्की मर्मत:

२। सबै ट्याङ्की मर्मत:

३। प्राविधिक समस्या देखिएको पाइपलाइन फेर्नुपर्ने (डाँडाटोल, मासिनार)

४। मेनपाइप मुहान देखि फिल्टर सम्म पाइप खन्नु पुर्नु पर्ने:

५। मुहान, गोठेनी, मझौला सुधार गर्नुपर्ने:

४) पाइप लाइन विस्तार:

१) कुरा बजार पूर्वी साइड लाइन विस्तार।

२) जरेबार: देखि [illegible] लाइन विस्तार:

३) [illegible] फाट जोडन फेर्नुपर्ने:

४) मधुहार पाइप विस्तार:

५) [illegible] पाइप विस्तार:

६) देउराली का.न.पा.–२ पाइप विस्तार:

१) [illegible] पाइप फेर्नु पर्ने
२) [illegible] गाउँ पाइप फेर्नु पर्ने
३) [illegible] पाइप फेर्नु पर्ने
४) [illegible] पाइप फेर्नु पर्ने
५) [illegible] सिंचाई पाइप फेर्नु पर्ने
६) [illegible] महादेव मन्दिर [illegible] पाइप फेर्नु पर्ने
७) [illegible] सिंचाई [illegible] पाइप [illegible]
८) फुलबारी कमार पाइप फेर्नु पर्ने
९) फुलबारी कमार [illegible] पाइप मिलाउने

निर्णय नं. २: पुरा गर्नु पर्ने मापदण्डको [illegible] साथै [illegible] पुन निर्माण [illegible] पुरा गर्नु पर्ने मापदण्डको बारे नगर विकास कोषले [illegible] खानेपानीको [illegible] लाख [illegible] काम गरेको [illegible] १००० लाख [illegible] रु. [illegible] २५% (प्रतिशत) [illegible] रु. ५० लाख [illegible] कर्जा [illegible] संस्थाले रु. ४० लाख [illegible] ब्याज [illegible] संस्थाले [illegible] काम [illegible] गर्न [illegible] ब्याज [illegible] संस्थाले [illegible] विकास गर्दै [illegible] संस्थाले [illegible] १०% [illegible] ५% मात्र [illegible] नगर विकास कोष [illegible] अनुरोध गर्ने निर्णय गरियो।

निर्णय नं. ३:
विविध [illegible] पहिलो [illegible] अनुरोध गर्दै, [illegible] प्रति [illegible] धन्यवाद ज्ञापन गर्दै आजको बैठक समापन गर्ने निर्णय गरियो।

Phase 2

आज मिति २०७८।६।०८ गतेका दिनमा यस ठिकेदार खानेपानी तथा सरसफाई उपभोक्ता समितिको आह्वानमा सरोकारवालाहरु सम्मिलित एक भेलाको आयोजना गरियो।- सो भेलामा छलफल हुँदा हाल चालु हुन लागेको खानेपानी क्षमता अभिवृद्धि कार्यक्रम (Enhance Functionality in Small Town Water Supply and Sanitation Sector project) कार्यान्वयन गर्दा वातावरणमा कुनै प्रतिकूल असर नपर्ने जग्गा अधिग्रहण गर्नु नपर्ने र पुनर्वासको व्यवस्था समेत गर्नु नपर्ने देखिएकाले सोही अनुसार सबै सरोकारवालालाई जानकारी गराइयो।

चन्द्रकान्त झा :- वातावरणविद् इ-होवो - सीईए - यूनिड - ओ.मी

उपस्थिति:-

क्र.सं.	नाम, पद	ठेगाना	हस्ताक्षर
१	नरेन्द्र देव ओखेट (अध्यक्ष)	ड.न.पा.-७. डाडाटोल	
२	गीता थापा (उपाध्यक्ष)	ड.न.पा.-६. राजमार्ग	
३	दिप प्रकाश ओखेट (सचिव)	ड.न.पा.-६. कुमेखाल	
४	सुरज मिश्र (कोषाध्यक्ष)	ड.न.पा.-६. थान्तारे	
५	सिद्ध डावर (सदस्य)	ड.न.पा.-६. कुमेखाल	
६	लोक विक्रम थापा (सदस्य)	ड.न.पा.-६ राजमार्ग	
७	प्रेमेश्वर कुमार वर्मा (सदस्य)	ड.न.पा.-६ राजमार्ग	
८	प्रशान्त खड्का (सदस्य)	ड.न.पा.-६ पुरानबजार	
९	निर्मला पोखरेल (सदस्य)	ड.न.पा.-६ चिचाई	
१०	ओम बहादुर कुलपोखी	ड.न.पा.-६ सिरसटोल	
११	बलराम ढुंगाना	ड.न.पा.-६ चिचाई	
१२	गिता ओखेट	ड.न.पा.-७. माथिल्लोटोल	
१३	सुमना श्याम	ड.न.पा.-६ पानीट्याङ्की	
१४	गंगा कुमारी कार्की	ड.न.पा.-७. डाडाटोल	गंगा कार्की
१५	सूर्य बहादुर खड्का	" " -७. बडेआर	
१६	कल्याण राम घिमिरे	" " -६ सिरसटोल	
१७	चन्द्र प्र. वि. प.	" " -७. बडेआर	
१८	गोकर्ण सुवेदी	" " -६ राजमार्ग	
१९	पद्म कुमार वर्मा	" " -६ सिरसटोल	

२०	दुर्गा प्रसाद अधिकारी	गा.वि.स.-६ रानमाटा	[signature]
२१	राधा खड्का	गा.वि.स.-६ घास्सारे	[signature]
२२	सानु बस्नेत	गा.वि.स.-६ डाडाटोल	[signature]
२३	राधा पोखर	गा.वि.स.-६ घास्सारे	[signature]
२४	मधु कुमारी ठकुरी	" " -६ छिनाई	[signature]
२५	देव बहादुर कार्की	" " -६ वडैटार	[signature]
२६	पद्मा कुमारी ठकुरी	" " -६ रानमाटा	पुमा
२७	नर बहादुर वि.क.	" " -६ डाडाटोल	नरवी
२८	कुमार सुनुवार	" " -६ पानीट्याङ्की	[signature]
२९	कल कुमारी लामा	" " -६ माझीटार (फुलबारी)	धन
३०	मेनुका लिम्सेना	" " -६ कुकुरमारखोर	[signature]
३१	गोविन्द बस्नेत	" " -६ धुलभार	[signature]
३२	विर्ख बहादुर श्रेष्ठ	" " -६ ठुलेबास	[signature]
३३	मंजमती खड्का	" " -६ धुलभार	[signature]
३४	टंकलाल श्रेष्ठ	" " -६ डाडाटोल	ई कालो
३५	मुरारी श्रेष्ठ	" " -६ डाडाटोल	[signature]
३६	दिल बहादुर खड्का	" " -६ घास्सारे	दिलबहादुर
३७	भोजहरी पडेल	" " -६ डाडाटोल	भोजहरि पडेल
३८	मल बहादुर राई	" " -६ फुलबारी दमार	[signature]
३९	शम्भु बहादुर कार्की	" " -६ रानमाटी	[signature]
४०	राम बहादुर खड्का	" " -६ पानीट्याङ्की	[signature]
४१	तारा पोखरेल	" " -६ छिनाई	तारा पोखरेल
४२	मञ्जु वर्मा	" " -६ रानमाटा	[signature]
४३	शिवराम श्रेष्ठ	" " -६ ठुलेबास	[signature]
४४	राम बहादुर गुरुङ	" " -६ पानीट्याङ्की	राम
४५	लाल ब. श्रेष्ठ	" " -६ वडैटार	[signature]
४६	मुकुन्दप्रसाद वालिके	" " -६ हस्पुटोल	[signature]
४७	कल्पना कार्की	" " -६ घास्सारे	[signature]
४८	सुनमाया तामाङ	" " -६ घास्सारे	[signature]
४९	अमरेश चन्द्र बैदार	क.न.पा. ६, सिन्धुली	[signature]
५०	गंगा कुमारी राउत	गा.वि.स.-६ पानीट्याङ्की	[signature]
५१	विमला बस्नेत	गा.वि.स.-६ वडैटार	[signature]
५२	नारायण चं. थापा	क.न.पा. देरातमाटा	[signature]

	नाम	फोन	सही
५३	राम बं. मुर्जेला		राम
५४	राम बा. [illegible]	९८४४४०८०४४०	
५५	रविना थापा मगर	कु.न.पा. ६ फुलवारी	
५६	सरस्वती थापा मगर	" " " " " "	सरस्वती
५७	शोभा कु. थापा मगर	" " " " "	शोभा
५८	कुमार राजा थापा	कु.न.पा.-६ [illegible]	
५९	बिन्दा कुमारी [illegible]	कु.न.पा.-६ [illegible]	
६०	सेर बहादुर नेवा. खड्गी	कु.न.पा.६ [illegible]	
६१	गीता कुमारी देवकोटा	कु.न.पा.६ सिंचाई	गीता
६२	रेवती कुमारी [illegible]	कु.न.पा.६ सिंचाई	रेवती
६३	तिलक बहादुर सुनुवार	कु.न.पा.६ [illegible]	
६४	[illegible]	कु.न.पा.-६ पानीट्याङ्की	
६५	हस्त बहादुर थापा मगर	कु.न.पा.६ [illegible]	
६६	पार्थिक [illegible] थापा	कु.न.पा.६ [illegible]	
६७	[illegible] बहादुर थापा	कु.न.पा.-६ [illegible]	
६८	जनक बहादुर थापा	कु.न.पा.६ [illegible]	
६९	धनराज नेवा खड्गी	कु.न.पा.६ सिंचाई	
७०	[illegible] बहादुर [illegible]	कु.न.पा.६ [illegible]	
७१	[illegible]	कु.न.पा.-४ [illegible]	
७२	[illegible] बहादुर [illegible]	कु.न.पा.६ [illegible]	
७३	मदनकुमार पाण्डे	कु.न.पा.६, [illegible]	Pandey
७४	पार्वती थापा	कु.न.पा.६ [illegible]	
७५	जनक राम [illegible]	कु.न.पा.६.	
७६	शोभा थापा	कु.न.पा.-६ [illegible]	
७७	[illegible] बहादुर [illegible]	कु.न.पा.-६ [illegible]	
७८	[illegible] कुमारी सुनुवार	कु.न.पा.-६ पानीट्याङ्की	
७९	[illegible]	कु.न.पा.-६ [illegible]	
८०	[illegible] घिमिरे	कु.न.पा.-६ [illegible]	
८१	[illegible] बहादुर [illegible]	कु.न.पा.-६ पानीट्याङ्की	
८२	[illegible] तामाङ	कु.न.पा.-६.	
८३	[illegible] थापा	कु.न.पा.-६ पानीट्याङ्की	
८४	[illegible] थापा मगर	कु.न.पा.-६	
८५	[illegible]	कु.न.पा.-६.	

८६	राम [illegible]	बु.न.पा-५ [illegible]	[signature]
८७	मल्ल बहादुर खेवट	बु.न.पा-५ [illegible]	
८८	धन बहादुर लो	बु.न.पा.६.	धन ब० लो
८९	किरण कुमार खेवट	बु.न.पा [illegible]	[signature]
९०	विश्वनाथ बराल	बु.न.पा-५ [illegible]	[signature]
९१	तिलहरी पाहाल	बु.न.पा-५ [illegible]	[signature]
९२	राम प्रसाद शर्मा	बु.न.पा-५ [illegible]	रामप्र शर्मा
९३	[illegible] खेवट	बु.न.पा-५ [illegible]	[signature]
९४	[illegible] प्रसाद पाहाल	बु.न.पा-५ [illegible]	[signature]
९५	[illegible] थापा	बु.न.पा-६. [illegible]	[illegible] थापा
९६	[illegible] थापा	बु.न.पा-६ [illegible]	[signature]
९७	पद्मा कुमारी घिमिरे	बु.न.पा-५ [illegible]	पद्मा कुमारी
९८	चन्द्र बहादुर नेपाली खड्का	बु.न.पा-६ डाडाटोल	चन्द्र [illegible] खड्का
९९	मिना खड्का	,, ,, -६ डाडाटोल	मिना [illegible]
१००	भिम ब. [illegible]	,, ,, -६ डाडाटोल	[signature]
१०१	नन्दलाल पहाडी	,, ,, -६ पाँचपुरे	[signature]
१०२	हस्त बहादुर [illegible]	,, ,, -६ पाँचपुरे	हस्त [illegible]
१०३	नारायण बहादुर [illegible]	,, ,, -६ [illegible]	[signature]
१०४	रवी ब. [illegible]	,, ,, -६ डाडाटोल	[signature]
१०५	राम [illegible]	[illegible]	[signature]
१०६	प्रकाश चन्द्र [illegible]	[illegible]	[signature]
१०७	भुपेन्द्र [illegible]	जि. वि. स. प्रतिनिधि	[signature]

Project Photographs

Photos on Public Gathering Meeting on Environmental and Social Issues

KAMALAMAI

Photo No. 1

Photo No. 2

Photo No. 3

Photo No. 4

Photo No. 5

Photo No. 6