ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE REHABILITATION OF NZOVE 1 WATER TREATMENT PLANT AND WATER DISTRIBUTION NETWORK IN KIGALI.

WASAC
Water & Sanitation Corporation
'Dignifying Life'

By

SMEC
Member of the Surbana Jurong Group

local people
global experience

Prepared:

KABANDA Philbert
Lead EIA Expert (RAPEP/EA/021)
Certified Valuer (RC/IRPV/169/2018)
Phone: +250788507656/738507656
Email: kabandaphilbert@gmail.com

Oct 2020

EXECUTIVE SUMMARY

The Environment and social impact assessment report for the project of rehabilitation of Nzove I Water treatment plant (WTP) was prepared with reference and in compliance with the provisions of the existing legal and regulatory tools in force such as in the Organic Law determining the modalities of protection, conservation and promotion of the environment in Rwanda, published in the Official Gazette RWA Nº 9 of the 1st May 2005; The Chapter IV of the organic law on environmental protection, conservation and management, Article 65, clearly calls for the need to subject projects to mandatory Environmental and social impacts assessment (ESIA). The Article 65 further specifies that every project shall be subjected to environmental assessment prior to its commencement; The Law on Environment N°48/2018 of 13/08/2018; Ministerial order N.001/2019 of 15/04/2019 establishing the list of projects that must undergo environmental impact assessment, instructions, requirements and procedures to conduct EIA, the Ministerial order relating to the requirements and procedures for environmental impact assessment, 2018 as well as the general guidelines and procedures for environmental impact assessment, 2006. In addition, Reference was also made to the AfDB Integrated Safeguard Systems (ISS) approved in 2013, designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects.

1. Background

Recognizing the key role of water and sanitation in protection of public health, socio-economic development and gender empowerment, the Government of Rwanda has committed itself to reaching very ambitious targets in water supply and sanitation for achieving 100% access to clean water. Over the time, The Government of Rwanda has realized the high rate of urbanization in Kigali and other secondary cities requires continual improvement and upgrade of infrastructures in Water and Sanitation sector in order to provide continuous, satisfactory and sustainable water supply and sanitation services in Rwanda.

It is in this regard, the Water and Sanitation Corporation Ltd (WASAC Ltd.) appointed SMEC International (Pty) Ltd (SMEC Int.) to provide Consultancy Services for the Elaboration of Feasibility Study and Detailed Design for Rehabilitation of Nzove I Water Treatment Plant and Water its main water transmission Network in Kigali. The Government of Rwanda has a set of environmental and social assessment procedures that formalize the process to be followed when formulating, designing, constructing and operating water supply programmes and projects in which the Rehabilitation of Nzove 1 Water Treatment Plant and Water Distribution Network in Kigali falls under. In this context, this is the ESIA report was prepared.

2. Objectives of the Study

In compliance with the requirements of the legal and regulatory tools mentioned above, an ESIA is prepared and submitted to RDB for approval prior to the implementation of the project. The overall objective of the project is the Rehabilitation of Nzove 1 Water Treatment Plant and its main transmission pipeline. Therefore, the objective of this ESIA study is to identify, predict and determine adverse impacts of the proposed project on the environment and develop mitigation measures.

3. Project Justification

The Government of Rwanda has realized the high rate of urbanization in Kigali which requires continual improvement and upgrade of infrastructures in Water and Sanitation sector in order to provide continuous,

satisfactory and sustainable water supply and sanitation services in Rwanda. The water demand analysis done during feasibility study indicated a need of 98,155m^3/d for Kigali city by 2021 projected to be 288,614 m^3/d by 2050. In order to satisfy this demand, Nzove water treatment complex (hosting Nzove I, II and III) need to have a reliable source, appropriate treatment system and an adequate bulk water transmission system to ensure beneficiary satisfaction.

An in-depth analysis conducted on the existing Nzove I water supply system revealed that the whole Nzove water treatment complex has a production capacity of 97,310m^3/day. From this, Nzove I WTP which was initially designed with a production capacity of 40,000 310m^3/day, is producing only 13,100310m^3/day (working only at 32.75%) and this is one of the main causes insufficiency of water required to satisfy the demand. The study has identified the causes and proposed solutions to renovate the Nzove I WTP from the water sources, treatment system and transmission line and recommended as an urgent project to be implemented.

4. Project Proponent

WASAC Ltd is the entity representing the Government of Rwanda to promote and bring improvements in water and sanitation sector by initiating, conducting studies and implementing projects in the sector. Therefore, the project proponent for Nzove I rehabilitation is WASAC and shall be implementing the project.

5. Project Financier

The project financier for the rehabilitation of Nzove I supply system is the African Development Bank for the project works implementation while the Government of Rwanda will cover the expropriation under this project.

6. Scope of the Project and brief baseline of project area description

Scoping study was undertaken by the consultant with the intention of collecting enough and relevant information so as to ensure a focused ESIA/ESMP. The scope of this study will be restrained to areas located in Nzove 1 and 2 Water Treatment Plants located in Nzove Cell, Kanyinya Sector of Nyarugenge District in Kigali City. The well field to be developed and improved are located in the same administrative location as the WTP while the clear water transmission main will start from Nzove clear water tank, pass through Nyabugogo Cell of Kigali Sector in Nyarugenge District, Nyamugali Cell in Nyarubimbura village of Gatsata Sector and Ruhango cell of Gisozi sector both of Gasabo District, all in the City of Kigali.

One part of the project area is located in Nyabarongo marshland in the shore of Nyabarongo river. This is specifically the well field consisting of boreholes providing raw water, raw water collection system and transmission to Nzove I WTP and this area dominated by sugar cane plantation and scattered seasonal crops. The river banks of Nyabarongo are protected by huge bamboo plantation. In addition, the local population planted pennisetum grass in a stretch of about 10 meters from the river for production reasons, processed in various handicraft products. The other part of the project area hosting the WTP itself is within in mixed land use area. It varies from urbanised area to semi urbanised area and from residential to industrial zone. The urbanised area is not dense and characterized by residential, commercial houses and public services building such as schools, market and health facilities. The industrial zone of the project area is dominated by the existing Nzove water treatment plant and Skol Breweries factory.

7. Approach and Methodology of the Study

This study followed procedures stipulated in the legal and regulatory tools stated in the first paragraph of this executive summary. There has been meetings and consultations with stakeholders and project beneficiaries and population owning lands/plantations in the proposed project and the views are presented in this report in the sub-section of stakeholder's consultations, views and suggestions. Site locations, land cover, and proposed infrastructure were described fully with clear maps for a comprehensive understanding of the area and project activities and to make the task of planning and monitoring easier during the implementation of the mitigation measures for the identified impacts through preliminary assessment, public consultations, baseline data and information, environmental and social positive and negative impacts analysis and mitigation measures proposal.

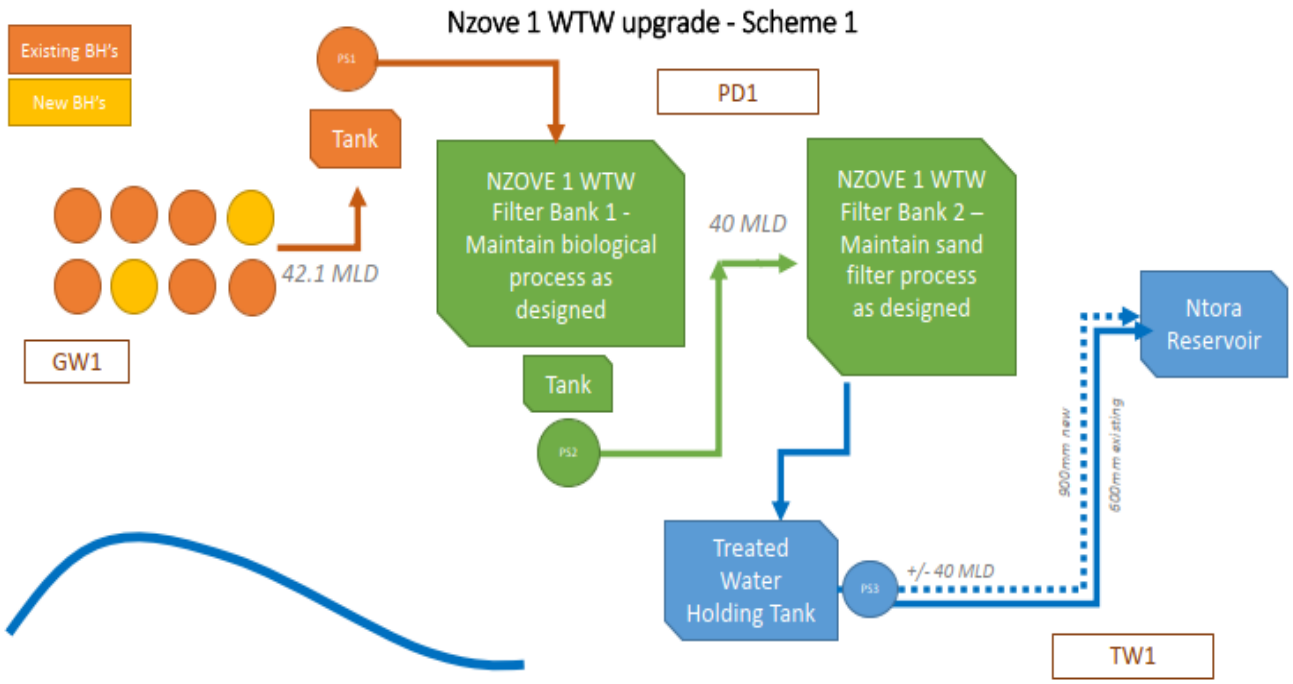
8. Project Description

The feasibility study has indicated that Nzove I WTP had initially the design capacity of 40m3/d and the assessment is indicating that its current production capacity is 13,100 m3/d. Hence the project for rehabilitation of Nzove I intended to conduct thorough assessment of the cause of decline in the production capacity starting from the raw water abstraction (existing groundwater wells), the raw water collection pipeline, the WTP treatment units and the transmission line.

The adopted option for detailed design consist of works as summarized hereafter:

- Groundwater water abstraction from Nzove well field: 58 (10 rehabilitated & 40 newly developed) boreholes with a total capacity of 56,205 m3/d (only 42,105m3/d to be extracted sustainably).
- 9.8 km long pipelines (raw water collectors, manifolds and transmission), with varying diameters from 150mm to 600mm.
- Nzove I Water Treatment Works with total capacity of 42,105, m3/d.
- Nzove I Pumping Station with all civil infrastructure and ME components (Backwash pumps - 1,200m3/h, Low lift pumps – 32,105m3/day, & High lift pups - 40,000m3/day).
- Air blower station with 780m3/h capacity.
- 8,8km long DN600 clear water transmission.

The general water supply scheme for the components and works mentioned above is illustrated in figure below:



8.1 AcviVities to be carried out

-Well field development: This include development and construction of 58 boreholes (10 are existing to be rehabilitated while 48 are new) with a production capacity of 42,105m^3/d. Each borehole expected to be 16m deep, water to be pumped through a riser pipe to a common raw water collection pipeline, average yield between 6.5 and 12.2 L/s and average dynamic water level between 5 and 7 mgbl. In general, each borehole has been designed to have the following components: fence size of 13.4 x 12.4m with gate for well protection, drainage system around the borehole site, access road for operation and maintenance of the well, water tap for sampling, supply services and watering the garden compound, reinforced concrete chamber size of 2.0 x 2.0 m for well head protection. The chamber height to be extended up to 1350.5 masl (0.62m above the maximum blood level)

-Raw water collection and conveying Pipework: The raw water rising main has a nominal diameter of 600mm and designed to transport 487.33l/s. This 9.8 Km collection pipework system consists of: 1) Riser pipe for conveying water from submersible pumps to subsidiary laterals; 2) Lateral pipes, for conveying water from riser pipes to raw water transmission; 3) Raw water rising main for conveying water from laterals to spray aerator; 4) Borehole submersible pumps for lifting from boreholes dynamic water levels to spray aerator. The submersible pumps are designed to lift water from the boreholes average dynamic depth of 5 to 7 mgbl and pump position of 10 to 13 mgbl for rehabilitated and new boreholes respectively to Nzove I WTP aerator located at 1364masl.

-Rehabilitation of Nzove I WTP

The following activities have been recommended for rehabilitation of Nzove I WTP: i) Renovation of the treatment system, a number of anomalies identified in aeration system, pH regulation and filters will be replaced and renovated to work efficiently. It is worth recalling that, as raw water is groundwater, the

treatment system is not full conventional. The civil structure of the WTP will be subject to renovation works summarized hereafter:

Cutting out spalled and poor-quality concrete and repair with an epoxy-based mortar

Cleaning rusted rebar and painting with rust inhibitor

Strengthening the structures with an extra rebar/or dowels, or stainless steel supports. The details of each task to be performed in order to get sustainably renovated civil infrastructures of the Nzove I WTP are provided in section 8.3 of the executive summary and detailed in this report.

The following water processes indicates that only lime for pH correction and Chlorine for disinfection will be required as chemicals:

- The raw water is pumped from the well field directly to the spray aerator installed on the biological filter/oxidation filter.
- The aerated raw water is sprayed directly on the surface of biological filter/oxidation filter.
- Lime is added at the biological/oxidation filter and the aeration process takes place that enables the precipitation of ferric (metal) precipitates from the soluble to the insoluble forms that can be removed in the subsequent filtration step.
- The water from the biological filter then drains to a receiving tank (intermediate tank) from where it is pumped through the dual media, direct filtration rapid gravity sand filter
- The product water from the rapid gravity sand filter is then accumulated in a clear water tank, chlorinated and distributed through a high lift pumping station for use in the town

-Rehabilitation of clear water transmission main

The transmission main is to deliver water, at relatively high velocity, from clear water tank at Nzove I WTP to Ntora reservoirs. Connecting these pipes with distribution systems will involve significant costs in terms of control valves as well as difficulties in operation and maintenance. The pipe details are: Length of pipeline is 8.8 Km; Class K9 ductile iron; Wall thickness of 9.8mm with cement mortar lining; Effective internal diameter of 600mm; pressure rating of PN40. The rehabilitation works for the pipeline are:

i) Surge vessels: Surge vessels to be inspected, tested and serviced prior to installing higher capacity pumps; they mau require new coat of high-quality protective coating; All valves/meters and fittings associated with surge vessel to be tested and replaced if not operational.

ii) Air valves: Clean and service all air valves; Replace any air valve that are not fully operational; Clear air valve chambers and repair structures where needed; Repair locks/replace and secure air valves.

iii) Pipes: All pipe to be inspected for external corrosion or physical damage; pipes in culverts or on bridge supports to be inspected and external coatings applied where deemed necessary; Bridge supports to be inspected and reinforced where settled or damaged by floods/debris. Exposed flanges or bolts to be protected using suitable Denso tape/putty or similar approved.

iv) Meters & gauges: they are to be thoroughly inspected during the pre-construction. Any of these facilities found faulty will be refurbished or replaced with calibrated equipment to the defined standard.

In summary, all activities and actions required are presented below:

System	Component	Flow m^3/day		Required Actions
		Existing	Design	
Nzove I	Boreholes / Well field	13,100	42,105	Rehabilitate & develop new
	Submersible pumps		400 – 1,440	Replace (New)
	Borehole protection		-	New
	Raw Water Transmission	42,105	42,105	Rehabilitate & upgrade
	Water Treatment Works	26,320	42,105	Major Renovation
	Reservoirs (clear water & backwash tanks)	26,320	42,105	Minor rehabilitation
	Pumping House	N/A	40,000	Minor rehabilitation
	Clear Water Pumps	N/A	40,000	Upgrade
	Treated Water Transmission	N/A	40,000	Rehabilitate

8.2 Construction method

The construction method to be applied to the execution of this project for the rehabilitation of Nzove 1 consist in a combination of a mechanized and manual methods. This because some of the works like wellfield development by boreholes drilling, concrete mixing, soil excavation, etc will be executed by machines with only few staff to makes required commands on the machine. On the other side some works works like masonly works, welding, electrification, internal finishing's, etc will be executed manually by manpower to be hired.

8.3. The equipment and materials required during project implementation

During the project implementation, a number of materials and equipment shall be supplied for the works execution, the following table indicate the equipment to be used during construction activities.

No.	Equipment Type and Characteristics	Minimum Number required
1	Trucks to transport pipes and construction material	**1**
2	Dumper Trucks (load capacity ≥ 15 m³)	**1**
3	Excavator ≥ 130hp, bucket ≥ 1,5m³) for only lot 6	**1**
4	Self-loading concrete mixer (≥ 500 litres)	**1**
5	Pick up for transport staff (≥ 4WD)	**2**
6	Topographic survey equipment (New)	**3Total stations, 3 Dump level, 3 GPS**
7	Drawing software and equipment AutoCAD, ArcGIS or equivalent, plotter, computers	**1**
8	Drilling machine	**1**
9	Drilling Surveying camera	**1**
10	Concrete sampling and testing material set	**1**
11	Geotechnical sampling equipment set	**1**
12	Pressure testing equipment's (set)	**1**
13	Concrete vibrators (≥ 3 hp/6 cm)	**2**
14	Dewatering pumps (≥ 15 m³/h)	**2**
15	Generator (≥ 20 KVA)	**2**
16	Truck Water Tank (≥ 10 m³ or 10000 liters)	**1**
17	Fully hydraulic truck crane (≥ 100,000 kg/30,000kN.m)	**1**

- This list is not exhaustive; the Contractor may provide additional equipment it deems necessary to complete the works within the contractual period
- All equipment's age shall not exceed ten (10) years.

In addition to the equipment to be used, the construction activities will require a number of materials that will be used to execute works as indicated in the table below:

S/N	Material	Use	period of need and use	Source of supply
1	Sand	For concrete and masonry works	Construction, Operation and maintenance	Available in many quarries in Rwanda
2	Stones	For foundations and other masonry works	Construction	Available in many quarries in Rwanda
3	Other aggregates	For concrete and masonry works	Construction	Available in many quarries in Rwanda
4	Cement	For concrete and masonry works	Construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
5	Paints	Finishing works	Construction and operation &maintenance	Manufacturing factories in Rwanda and in the region with access to Rwanda market

6	Steel bars	Concrete works	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
7	Metallic tubes	Roffing, doors, windows,etc	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
8	Ceramic tiles	For interrior finishing	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
9	Pipes	for pipeline networks constrution and plubling and sanitary works	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
10	Chemicals such as lime and chlorine	Water treatment	operation	International manufacturing companies
11	Pumps	pumping water to the the higher elevation destination	operation	International manufacturing companies
12	Lifting crane	For operation and maintenance in the submersible pumps system	operation	International manufacturing companies
13	generator	Back up during power cut	operation	International manufacturing companies
14	Petroleum derivatives	To run generator	operation	Locally available from traders
15	Protective equipments such as gloves, overals, goggles, etc	For safety of personel on work	operation	International manufacturing companies
16	Tiles	for roof coverage	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
17	Electric wires	Electrification of premises	construction	Locally available
18	stailness steel metals	all structures that shall be in permanent contact with water in the WTP, tanks and other systems	construction	International manufacturing companies
19	Fittings for water network	connection, jointing, branching, embeddment, etc in the water supply system	construction	International manufacturing companies

The raw materials like cement, sand, stones, etc. for civil works shall be purchased locally. In fact there are a number of quarries that are certified to supply sand and stones in many parts of Rwanda as well as cement, paints, stell bars, electric wires, etc. manufacturing factories in the country and in the region. Similarly, pipes manufacturing companies are available in the country and in the region and the supply will be subjected to the selection based on the highest quality condition. It is worth recalling that some other materials like pumps, fittings for large pipes, chemicals for water treatment plants such as chlorine and its derivatives for disinfection etc are to be supplied from international companies or manufacturers. As they are not locally available whereas lime can be found in the region.

During operation

Based on the treatment process to be used , being only,, aeration pH regulation and disinfection, the following chemicals will be required.

- Treatment: Lime $Ca(OH)_2$

•Disinfection:
-Calcium hypochlorite $Ca(OCl)_2$.
-Sodium chloride (Nacl): in electrolysis and gives the final used product called Hypochlorous acid

9. Policy, legal and Institutional arrangements

9.1 At national Level

About legal framework, a number of laws that were taken in into considerations by indicating their provisions relevant to the implementation of the project for rehabilitation of Nzove I. These start with the constitution of the Republic of Rwanda of 2003 revised in 2015 stressing the right to live clean and healthy environment and the duty of everyone to protect, safeguard and promote it. In the same line, the Organic law of 2005 requiring projects mandatory to conduct Environmental Impact Assessment (EIA), the law on environment, 2018 and related ministerial orders for list and requirements for projects to conduct EIA complement the actions required in projects implementation to safeguard healthy environment. In addition, the law No.49/2019 on use and management of water resources is relevant as the project requires water abstraction permit that check that fact of no harm to environmental flow and conflict of use. The land law of 2013 was considered as land use and management as well as all transactions related to lands in this project the project will require to the complying with provisions of the law. The law relating to the expropriation to the public interest, 2015 will be guiding the effective compensation of affected persons while the law regulating labor in Rwanda will be reference to put in place an effective occupational health and safety framework, with equal opportunity provisions, preventing discrimination and child labor as well as Rwanda building control regulations, 2012. Other laws and ministerial orders to guide the project execution are detailed in the report.

The policy framework to guide the project include, National Strategy for Transformation (NST1) of which the project aims to contribute the targets, National environmental and climate change policy 2019 as the project need to ensure protection of environment, National land policy 2004 as the project will require lands for implementation, National health policy 2016, as the project execution has be in good and safe working conditions, National sanitation policy 2016 as the project has to ensure the generated waste is appropriately managed without harming health and environment, national water supply policy 2016 by which the provisions have to be implemented in this project, as well as other policies detailed in this report.

The institutional framework has identified institutions whose roles will be relevant to the implementation of the project. In fact, MINIFRA is the leading ministry and monitoring institution for the implementation and progress of projects in the sector of water supply while WASAC is the implementing agency of the project. Rwanda National land use Authority will perform all the transactions required for the lands to be acquired under this project while Rwanda water resources board is responsible to ensure that the exploitation of water resources by this project is complying with laws and regulations provisions. Rwanda standards board is responsible to issue all the standards that the project will comply with, these include standards for works, material, occupational and safety, etc. The project will require to connect its premises and electromechanical system to the national grid and REG will be advising and performing such works.

One of the regulatory tool to be complied with by this project is the Rwanda Standard for potable water RS EAC 12:2018 entitled Potable water specification. This is because the main objective of the project consists in suppling to the residents of Kigali City with sufficient and safe/potable water. The key parameters of this standard that potable water has to comply with are in the following table:

a)Physical characteristics

Table 3.2.1: Physical requirements for potable water

Sl. No.	Characteristic	Treated potable water	Natural potable water	Method of test
i)	Colour (TCU [a] max)	15	50	ISO 7887
ii)	Turbidity (NTU max)	5	25	ISO 7027
iii)	pH	6.5 – 8.5	5.5-9.5	ISO 10523
iv)	Taste	Not objectionable	Not objectionable	-
v)	Odour	Odourless	Odourless	-
vi)	Conductivity (µS/cm)max	1,500	2,500	ISO 7888
vii)	Suspended matter	Not detectable	Not detectable	ISO 11923

a) True colour units (TCU) mean 15 hazen units after filtration.

b)Chemical characteristics

Table 3.2.2: Chemical requirements for potable water

Sl. No.	Substance or characteristic	Treated potable water (mg/L max.)	Natural potable water (mg/L max.)	Method of test
i)	Total dissolved solids	700	1500	ASTM D 5907
ii)	Total hardness, as $CaCO_3$,	300	600	ISO 6059
iii)	Aluminium, as $Al3^+$,	0.2	0.2	ISO 12020
iv)	Chloride, as Cl^-	250	250	ISO 9297
v)	Total Iron as Fe	0.3	0.3	ISO 6332
vi)	Sodium, as Na^+	200	200	ISO 9964-1
vii)	Sulphate SO_4^{2-}	400	400	ISO 22743
viii)	Zinc, as Zn^{2+}	5	5	ISO 8288
ix)	Magnesium, as Mg^{2+}	100	100	ISO 7980
x)	Calcium, as Ca^{2+}	150	150	ISO 7980

c)Inorganic contaminants

Potable water shall conform to the limits of inorganic contaminants affecting safety indicated in Table 3.2.3.

Table 3.2.3: Limits for inorganic contaminants in natural and treated potable water

Sl. No.	Substance or characteristic	Treated potable water (mg/L max.)	Natural potable water (mg/L max.)	Method of test
i)	Arsenic, as As	0.01	0.01	ISO 11969
ii)	Cadmium, as Cd	0.003	0.003	ISO 5961
iii)	Lead, as Pb	0.01	0.01	ISO 8288
iv)	Copper, as Cu	1.000	1.000	ISO 8288
v)	Mercury (total as Hg)	0.001	0.001	ISO 12846
vi)	Manganese, as Mn	0.1	0.1	ISO 6333
vii)	Selenium, as Se	0.01	0.01	ISO 9965
viii)	Ammonia (NH_3)	0.5	0.5	ISO 11732
ix)	Chromium Total, as Cr	0.05	0.05	ISO 9174
x)	Nickel, as Ni	0.02	0.02	ISO 8288
xi)	Cyanide, as CN	0.01	0.01	ISO 6703
xii)	Barium, as Ba	0.7	0.7	ISO 14911
xiii)	Nitrate as NO_3^-	45	45	ISO 7890
xiv)	Boron,as Boric acid	2.4	2.4	ISO 9390
xv)	Fluoride, as F	1.5	1.5	ISO 10359
xvi)	Bromate, as BrO_3^-	0.01	0.01	ISO 15061
xvii)	Nitrite (NO_2^-)	0.003	0.003	ISO 6777
xviii)	Molybdenum	0.07	0.07	ISO 11885
xix)	Phosphates, as PO_4^{3-}	2.2	2.2	ISO 15681
xx)	Residual free Chlorine	0.2-0.5 a	Absent	ISO 7393

a :Under conditions of epidemic diseases, it may be necessary to increase the residual chlorine temporarily.

9.2. The project category with respect to AfDB ISS

The African Development Bank (AfDB) Integrated Safeguards System (ISS) is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. The safeguards aim to avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible as well as to minimize, mitigate, and/ or compensate for adverse impacts on the environment and affected people when avoidance is not

possible; and help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks. The preparation of the environmental and social impact assessment for the proposed project has also followed the AfDB Environmental and Social Assessment Procedure (ESAP) which divides projects into four categories:

- Category 1: projects are those that are likely to have significant and irreversible environmental and social impacts, widespread in extent and require a full ESIA.
- Category 2: projects are likely to have detrimental and site-specific environmental and social impacts that can be minimized by the application of mitigation measures included in an ESMP.
- Category 3: shall not induce any adverse environmental and social impacts and do not need further action.
- Category 4: projects involve investment of Bank's funds through Financial Intermediaries (FIs) in subprojects that may result in adverse environmental or social impacts. Specific requirements for this type of project include an assessment of FI capacities to handle environmental and social considerations.

Therefore, according the ESAP categorization, the proposed project for the Rehabilitation of NZOVE 1 Water Treatment Plant and Water Distribution Network in Kigali falls under a category 2 within the AfDB's ISS because the potential environmental and social impacts are not significant, localized in nature and can be managed via a robust ESMP which is an integral part of this ESIA.

9.3 Applicable international conventions

The implementation of Nzove I WTP shall ensure to comply with the provisions of the international conventions ratified by Rwanda, some are cited below while the full list and details are in the report.

- The BONN Convention opened for signature on June 23, 1979 on conservation of migratory species of wild animals as authorized to be ratified by Law No 35/2003 of 29 December 2003.
- The MONTREAL International Conventional on Substances that deplete the Ozone layer, signed in LONDON (1990), COPENHAGEN (1992), Montreal (1997), BEIJING (1999), especially in its article 2 of LONDON amendments and Article 3 of COPENHAGEN, MONTREAL and BEIJING amendments as approved by Presidential Order no 30/01 of 24 August 2003 related to the membership of Rwanda;
- The STOCKHOLM Convention on persistent organic pollutants, signed in STOCKHOLM on 22 May 2001, as approved by Presidential Order No 78/01 of 8 July 2002;
- The CARTAGENA protocol on biodiversity to the Convention on Biological biodiversity signed in NAIROBI from May 15, to 26, 2000 and in NEW YORK from June 5, 2000 to June 4, 2001 as authorized to be ratified by Law No 38/2003 of 29 December 2003;
- The KYOTO Protocol to the framework on climate change adopted at KYOTO on March 6, 1998 as authorized to be ratified by Law No 36/2003 of December 2003;

10. Project Alternatives

Three to four alternatives were proposed for the raw water development, treatment process while for the clear water transmission, option is unique to inspect and rehabilitate the main part as indicated in the sub-section of 8.4 of this executive summary. Finally, the non-project alternative was proposed, analysed and found not applicable as the gaps identified to be covered by this project are huge.

10.1 Ground Water Supply Options

The four options considered for groundwater to be the raw water source for Nzove I WTW are:
Option 1: Rehabilitate all 31 boreholes in order to produce a sustainable yield of 25.5 ML/day. Option 2: Rehabilitate as much of the existing system as possible, adopting the same or improved design for new/replacement BH's that will replace units that are no longer functional to meet the required 40 ML/day production. Option 3: Design an entirely new groundwater supply system in the vicinity of the Nzove WTW complex that would meet the required 40 ML/day raw water capacity – utilization of some or the entire existing pipeline system is considered in this option. Option 4 Design entirely two new groundwater supply systems in the vicinity of Nzove I WTW to supply 80ML/d. From analysis, the option 2 was the was found to be most economically feasible, socially acceptable and environmentally friendly and was selected. The full description of the factors that were based on to select and not to select an option are detailed in chapter 5 of alternatives.

10.2 Water treatment system options and WTP civil structure rehabilitation

The four process design options considered to treat raw water to acceptable potable quality for Nzove I WTW project are:

Option 1: Reinstate process design as originally planned, operating at 40 ML/day with raw water supplied from ground water source. This will require new boreholes etc., but the main advantage is that the existing process is retained. Option 2: Amend the design, increase the capacity to accept 80 ML/day from groundwater source, introduce aeration & sedimentation, convert biological filter to rapid gravity sand filter, re-instate rapid gravity sand filter bank 2, total combined capacity 80 ML/day. Option3: Abandon groundwater source, change to river abstraction, introduce aeration & sedimentation, mothball biological filter, re-instate rapid gravity sand filter, 40 ML/day total. Theoretically, in this case, the biological filter can be mothballed for future use. Our recommendation would however be to change it to a rapid gravity sand filter and to use both filter banks to purify the 40 ML per day. This will lead to a very conservative loading rate of approximately 3,5m/h which will have the benefit of longer filter runs and less frequent backwashing. Option4: Abandon groundwater source, change to river abstraction, introduce aeration & sedimentation, convert biological filter to rapid gravity sand filter, re-instate rapid gravity sand filter bank to, 80ML/day total. This option will be the ultimate solution for Nzove I. It will require full 80Ml/d aeration, coagulation, flocculation and sedimentation prior to the filtration on the existing biological filters (converted to rapid gravity sand filters) and the existing rapid gravity sand filters.
From analysis, the option 1 was the was found to be most economically feasible, socially acceptable and environmentally friendly and was selected. The works for rehabilitation of the civil structure of the WTP are detailed in chapter two of this report. The full description of the factors that were based on to select and not to select an option are detailed in chapter 5 of alternatives.

11. Environmental and social impact assessment

Under this chapter, physical environmental conditions, biological environment and socio-economic profile in the project areas of Nzove area in Kigali City are considered and discussed to understand the actual status of the project areas. The summary of predicted beneficial and negative impacts are provided in tables below while their details are provided in chapter 7 of this ESIA report.

Positive impacts

Expected project beneficial Impact	Why is beneficial	Significance	Duration
Job opportunity for local people and gender balance enhancement in terms of employment benefits.	The project will give priority of local residents for employment	Important/High	Temporary and permanent.
Knowledge transfer to local people.	All required works will be undertaken by local employees guided by the contractors 'experts	Important/High	Temporary.
Possibility of business hiring equipment.	Water availability will give room for other businesses requiring the presence of water	Moderate/Middle	Temporary.
Selling foodstuff and other materials.	Migrant workers will need to purchase a number of goods from local selling points	Moderate/Middle	Temporary.
Increase income for the population working for the project.	By employment in the project, wages will bring money circulation		Temporary and permanent.
Possibility of savings for workers.	Workers will use one parts of their wages for savings	Important/High	Temporary and permanent.
Increase to public revenues/taxes for both central and local authorities from construction materials.	The project itself has a component of paying takes; all materials to be imported will also pay tax	Important/High	Temporary and permanent.
Drinking water quality that meets national, regional, and international quality indicators.	Increased access to clean water will alleviate waterborne diseases; promote sanitation and hygiene and health in general	Important/High	Permanent.

Negative impacts

Negative Impacts	Proposed mitigation measures
Preparatory phase	
Risk of conflicts over discrimination, corruption and other conflicts during workforce recruitment	Priority of employment is given to the local people
	Compliance with national laws (workers with contracts, wages, no workers below the age of 16 years and no discriminations against women or other vulnerable).

Negative Impacts	Proposed mitigation measures
	Establish a Grievance Redress Mechanism
Potential risk of insecurity due to influx of job seekers.	The contractor shall develop and implement a Labour Influx Management Plan which include awareness of the local population to manage influx of workers.
	Establish a Grievance Redress Mechanism
Risk accidents during site installation, mobilization of materials and equipment will increase movement of vehicles, heavy trucks with high risk to induce accidents.	There shall be risk assessment for all proposed campsites subject to approval by the client.
	Campsite shall not be located in the very inhabited place especially those typical area where we find with kids playing on road.
	There shall be proper housekeeping plan to manage stock of materials.
	Provide Personal Protective Equipment (PPEs) to all workers (e.g., helmets, dust masks, gloves, safety glasses, boots, and high visibility jackets).
	The campsite shall be equipped with fire extinguisher and first aid arrangements
	Fence the campsite and post site safety notice at the entrance and prevent any entrance of visitors
	Avail tout-risque chantier insurance covering the entire construction site.
	Ensure that all workers have medical insurance.
Damage to ecosystem habitat and biodiversity loss	Safeguard protected plants and other plants where possible
	Earth and vegetation clearing shall be limited to the minimum required space.
	Restore the site and simulate the habitat, by re-planting indigenous tree species and plants.
Risks of conflicts related to loss of land or land acquisition. In this phase the land will be required to establish a project site (camp site)	Fair compensation at full replacement cost of properties and lands to be based on the approved Resettlement Action Plan, AfDB Operational Safeguard 2 and the Expropriation Law in Rwanda;
	Ensure participation of owners and local administration in all compensation process;
	Establish the Grievance Redress Mechanism
Construction phase	

Negative Impacts	Proposed mitigation measures
Impacts on water quality and subsequent ecosystems and habitat. The pollution shall be induced by works to establish water intake at the source increasing soil erosion and sedimentation.	Deviate water river when installing the water intake structure.
Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the neighbourhood may reduce
Loss of habitat and biodiversity due to site clearance, removal of top vegetable soil, and site leveling	Restore the site and simulate the habitat, by re-planting indigenous tree species and plants
	Safeguard protected plants and other plants where possible
Risks of accidents of animals, people living near the project area, workers by falling in the excavated pits, trenches.	Excavated trenches and pits shall be refilled immediately when the construction works is completed
	Excavated trenches and pits shall be protected by barricades or other safety barriers during the time those trenches or pits can't be immediately refilled.
Risk of road accidents as some of works will be completed on the main road to be crossed by the projects works	There shall be a risk assessment for all works that will be completed near the asphalt road.
	There shall be traffic management for all works that will be completed on the main road.
Risks of soil erosion: excavated soil if not remove can be eroded in the neighbouring areas.	Remove soil immediately after excavation and store it in designated place.
	Construct soil stability structure around stored soil.
Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	Established effective medical emergency response plan
	Ensure availed first aid kits.
	Safety signs availed at the site
	Personal protective equipment availed (Types and quantities)
	Documented risk Assessment and its communication
	Health and safety training program and filled training participation list
Disruption of road users' movement on the road due to road closer, deviation during pipes laying activities.	The contractor will seek permission to RTDA when there is planned work that will disrupt the road use.

Negative Impacts	Proposed mitigation measures
	There shall be signage to indicate the nature of disruption and guide road users on the alternative routes.
	There should be consultations in the planning phase on how the traffic will be managed for all activities completed on road.
Contamination of the soil, air and water by waste generated during construction works.	Follow the 3 R (Reduce, Reuse, Recycle) hierarchy used in waste management.
	Ensure proper mechanism to deal with spills (avail spill kits to contain oil and other chemical spill)
Risk of disease transmission between workers themselves, between workers and the local community (example of disease: HIV/AIDS, low hygiene related diseases)	Measures to prevent poor hygiene and sanitation including availing hand washing and proper sanitary facilities.
	Sensitize about prevention of HIV/AIDS and sexually transmitted diseases.
	Provide condoms in some places like toilets
	Recruit among local workforce so they can work and return at their home.
	Workers required to register to the mutuelle de santé.
Risk of delay or non-payment of casual labors	District will closely supervise timely payment of labor by the contractor,
	In case the contractor does not pay labor, the District shall hold his pending payment.
	WASAC should also request the contractor to provide an insurance covering this kind of issues.
Disturbance of the neighboring habitations due to noise, dust and vibration	Use of well-maintained and less heavy machinery that emits less gases and noise.
	Early engagement and awareness raising to the community about construction activities
	Provide personal protective equipment like dust mask and ear muffs.
	Work hours limited to the day working period (7h00 am to 5h00 pm)
Operational phase	
Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to

Negative Impacts	Proposed mitigation measures
	be replaced by wells development and likely water for plants in the neighbourhood may reduce
Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the neighbourhood may reduce
Impacts related to management of sludge (bad smell, water & soil contamination)	Establish sludge aerobic stabilization site which allows the reduction of odors, pathogens, the presence of viable seeds and shall prevent pollution to environment. The stabilized sludge shall be composted and used as soil amendment.
Risk of water leakage from broken pipes causing water and soil erosion.	Avail a team of trained technicians ready for repair at any time the pipes break
	Establish a water leakage reporting channel and communicate it to the people living near the WSS network
	Conduct awareness among the population in that area and ask them to communicate any water leakage they may notice.
Conflict may arise over insufficient water distributed and people may fight for the small quantities available inducing them into crimes.	Awareness on efficient use of natural resources available.
	Ensure continual supply of water and establishment of as many as possible community water points.
Risk of fire outbreak during the operations of the WSS especially at the water treatment facility	The water treatment plant shall be equipped with fire extinguisher and first aid arrangement
	Workers shall be trained how to use fire extinguishing system.
	A fire marshal team shall be established and trained to prevent and/or stop fire.
Contamination of the soil, air and water by waste generated during operations of the WSS.	Follow the 3 R (Reduce, Reuse, Recycle) hierarchy used in waste management. Separate waste from the source and ensure hazardous waste are properly disposed off.
Risk of increased greenhouse gas (GHG) emissions and amplified vulnerability to climate change.	Use renewable source of energy where applicable. Encourage the use of machinery and equipment with low emissions of GHG.
Decommissioning phase	

Negative Impacts	Proposed mitigation measures
Soil and water pollution (surface and ground water) due to construction waste generation	Follow the 3 R (Recover, Reuse, Recycle) hierarchy used in waste management.
	Non-reusable and non-recyclable materials shall be disposed in environmental approved manner.
Pollution to the ambient air affecting the air quality due to particulate matters that shall be released in the atmosphere from demolition activities.	Regularly spread of water on the site during demolition works.
	Manual demolishing to increase the quantity of materials recovered for reuse.
Increase of noise levels	The works shall be scheduled between 7 a.m and 5 pm to avoid noise during night.
	Preferably adopt labor intensive (manual) demolishing to avoid noise by machinery.
	Ensure good maintenance of machinery.
Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	Documented risk Assessment and its communication
	Established effective medical emergency response plan
	Ensure availed first aid kits and train workers on use.
	Safety signs availed at the site
	Personal protective equipment availed (Types and quantities)
	Health and safety training program and filled training participation list

12. Stakeholders involvement and public consultation.

Stakeholders engagement and public consultation were organized with the aim of making the ESIA study participatory and transparent; sharing the potential positive and negative environmental and social impacts and their proposed mitigations and inform the PAPS about their right and how they will be put in actions; explaining and make the compensation process transparent, but more detailed in the RAP, determining the attitudes of PAPS towards the proposed projects and finally provide a platform for future consultation

Consultation with local residents

Public consultation meetings were postponed due to COVID-19. These consultations resumed and held in all the villages visited and located in the project's direct area of influence as well as at District level where key project stakeholders were invited.

At village level, with support from chiefs of villages, meetings were held at cell offices bringing together people from concerned villages. Consultations started from 11/06/2023 and ended on 14/06/2023.

At cell level, in collaboration with Kanyinya sector authorities, District one stop centers. The cell authorities invited the local resident and neighbour of the project area, as well as the farmers in the Nyabarongo marshland where some of their crops might be affected.

The project shall affect few people as the activities shall be limited to trenches excavation. The main objective of the public consultations was to gather information on their concerns, perceptions, reactions and fears of the livelihood changes to be brought about as a result of the Project. Other specific objectives were to:

- Explain the project in deep to local people;
- Obtain socio- economic and environmental information on the community;
- Explain the process of the ARAP and its importance;
- Introduce resettlement grievance mechanism to people.

Communities were given some detailed information about the project through a presentation by consultant team. The presentation highlighted the project background, objectives, expected upcoming activities, potential socio-economic and environmental impacts. After the presentations the community was given opportunity to give their views, comments and queries. Questions were answered, clarifications offered and their recommendations received.

In general, the project was appreciated by all interested stakeholders as it will contribute to the national target of covering the whole country with access to clean water and thanked the Government of Rwanda for promoting modern households in their villages. The list of residents who attended the meetingas well as the minutes are attached to this report.

Table: 3 List of consulted people

No	Names	Institution	Position	Date of consultation
1	Eng. MUZOLA Aimé	WASAC	CEO	19/10/2020
2	GASHUGI Innocent	WASAC	Manager WoS	19/10/2020
3	NDAGIJIMANA Joseph	WASAC	Project Manager	19/10/2020
4	BIZIMUNGU Jean Bosco	WASAC	Senior Water Engineer	19/10/2020
5	MUREKEZI Dominique	WASAC	Manage,Infrastructure Planning	19/10/2020
6	BUSHAYIJA Yasin	WASAC	Head of Nzove WTP	19/10/2020
7	BYANYIMA Ben	WASAC	Environmental Specialist	20/10/2020
8	NSABIMANA Eric	WASAC	GIS Engineer	20/10/2020
9	HABIYAMBERE Emmanuel	WASAC	Water Engineer	20/10/2020
10	DUSHIMIRIMANA Valens	WASAC	Water Engineer	20/10/2020
11	NGENDAHAYO Emmanuel	WASAC	R&D Specialist	20/10/2020
12	UWANYIRIGIRA Clarisse	Kanyinya Sector	Executive Secretary	22/10/2020
13	HABAMUNGU Abdallah	Nzove Cell	Garage Owner	22/10/2020
14	MANIRAKIZA Dedine	Nzove Cell	Business woman	22/10/2020

15	TWAGIRIMANA Desire	Nzove Cell	Cyclist	22/10/2020
16	MASABO Jean Claude	Nzove Cell	Farmer	22/10/2020
17	MUKANKUBANA Mary	Nzove Cell	Local resident	22/10/2020
18	NTIGURIRWA Emmanuel	Nzove Cell	Local resident	22/10/2020
19	MANOVERI Vincent	Nzove Cell	Local resident	22/10/2020
20	MUKAHIRWA Jose	Nzove Cell	Local resident	22/10/2020
21	GAKUBA Fulgence	SMEC	Country Manager	23/10/2020
22	CORRIE Marx	SMEC	Treatment Expert	23/10/2020
23	NEIL Meyd	SMEC	Hydraulic Engineer	23/10/2020
24	GEBRESELASI Giji	SMEC	Team Leader	23/10/2020
25	TABARO Emmanuel	SMEC	Chief surveyor	23/10/2020
26	RUGWIRO Bonny Francis	SMEC	Surveyor	23/10/2020

13. ESIA disclosure

Public disclosure of ESIA report is a requirement of the AFDB's ISS. WASAC will make available copies of this ESIA report on WASAC website and at its headquarters' office. Copies will be also shared with RDB and REMA for monitoring purposes. The GoR will also authorize AfDB to disclose this ESIA report.

14. Environmental and social impact and mitigation measures

Environmental and social positive and negative impact related to the water supply project were assessed and identified basing on the types, nature, significance, duration, extent, reversibility and intensity. And ESMP was developed to propose mitigation measures related to the potential negative impacts. The proposed monitoring plan provides the monitoring indicator, frequency, responsible party and finally the monitoring budget. The role to be played by each institution in the implementation of ESMP is provided in chapter 8.

15. Additional Management Plans

In addition to the Environmental and Social Management Plan, Environmental and Social Management Plans, additional plans are developed to supplement and complement in proposing mitigation measures and monitoring strategies for sustainable implementation of the water project in Nzove area in Kigali City. Those plans include Contingency Plan, Community, Health and Safety Management Plan, Traffic Management Plan and Chance Find Procedure.

16. Conclusions and Recommendations.

This rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali project has many obvious benefits from the socio-economic point of view. Given the nature and location of the water supply project, the conclusion is that the potential impacts associated with the proposed project are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate environmental and social mitigation measures. However, it is imperative that a number of the proposed recommendations in this ESIA are given serious and strict considerations to preserve the environment during the project implementation and operation phases.

TABLE OF CONTENTS

ABBREVIATIONS

ARAP:	Abbreviated Resettlement Action Plan
AfDB	African Development Bank
BS	British Standards
CAE	Child Abuse and Exploitation
EA	Environmental Assessment
EAC	East African Community
EDPRS	Economic Development and Poverty Reduction strategy
EHS:	Environment, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender based Violence
GoR	Government of Rwanda
HIV	Human Immunodeficiency Virus
ISS	Integrated Safeguards System
MININFRA	Ministry of Infrastructure
MoE	Ministry of Environment
NLA	Rwanda National Land Authority (former RLMUA)
NGO	Non-Governmental Organization
NISR	National Institute of Statistics of Rwanda
NST1	National Strategy for Transformation
OS	Operational Policies
PAPs	Project Affected persons
RDB	Rwanda Development Board
REG:	Rwanda Energy Group
REMA	Rwanda Environment Management Authority
RoD	Record of Decision
RSB	Rwanda Standards Board
RURA	Rwanda Utilities Regulatory Authority
RWB	Rwanda Water Resources Board
STD	Sexually Transmitted Disease
ToRs	Terms of Reference
UNFCCC	United Nations Framework Convention for Climate Change
WASAC	Water and Sanitation Corporation
WHO	World Health Organization
WTP	Water Treatment Plant

CHAPTER 1: GENERAL BACKGROUND

1.1 BACKGROUND

Recognizing the key role of water and sanitation in protection of public health, socio-economic development and gender empowerment, the Government of Rwanda has committed itself to reaching very ambitious targets in water supply and sanitation. Over the time, The Government of Rwanda has realized the high rate of urbanization in Kigali and other secondary cities but this urbanization requires the basic infrastructures especially in Water and Sanitation sector which are considered as the basis for socio-economic transformation as well as the social welfare of the population.

It is in this regard that WASAC Ltd. is to provide continuous, satisfactory and sustainable water supply and sewerage services to all customers within Rwanda.

The Water and Sanitation Corporation Ltd (WASAC Ltd.) appointed SMEC International (Pty) Ltd (SMEC Int.) to provide Consultancy Services for the Elaboration of Feasibility Study and Detailed Design for Rehabilitation of Nzove I Water Treatment Plant and Water Distribution Network in Kigali.

The Government of Rwanda which is the funder has a set of environmental and social assessment procedures that formalise the process to be followed when formulating, designing, constructing and operating water supply programmes and projects in which the Rehabilitation of Nzove 1 Water Treatment Plant and Water Distribution Network in Kigali falls under.

The Ministerial Order N° 004/2008 of 15/08/2008 establishing the list of works, activities and projects that have to undertake an environmental impact assessment includes this project in a category of "water distribution activities and sanitation".

1.2 OBJECTIVES OF THE ESIA STUDY

The aim of this ESIA is to provide decision making information on environmental and social consequences of the proposed road and other associated accessories including footpaths and drainage and to contribute to sustainable urban development through the identification of enhancement measures to positive impacts and mitigation measures to adverse impacts. Specifically, the main objective is to develop a complete Environmental and Social Impact Assessment (ESIA) for the proposed rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali City.

The objectives of the proposed ESIA study are:

- To describe the existing environment and activities in the area of the project;
- To identify both positive and negative impacts of the project on the neighbouring environment (people, water bodies, soil, air, infrastructure, fauna and flora);
- To evaluate and select the best project alternatives and improve the environmental design of the project;
- To propose appropriate prevention, mitigation and compensation measures where adverse effects may occur during the construction and operation phases of the project in order to minimize or compensate negative effects of the project;
- To set up an Environmental and Social Management and Monitoring plan that will govern all activities of the project for the better protection of the environment, local communities, urban users;

This ESIA was conducted based on Terms of Reference provided to and approved by Rwanda Development Board (RDB), REMA guidelines for EIA and views and concerns from the affected people.

1.3 SCOPE OF THE STUDY

Scoping study was undertaken by the consultant with the intention of collecting enough and relevant information so as to ensure a focused ESIA/ESMP. The purpose of the scoping study for the project was:

- To consider the main environmental problems to be studied, alternatives and to ensure that the spatial and temporal scopes and extent of the environmental assessment is compatible with the size of the project;
- To determine appropriate ESIA methods relevant to the project's potential environmental and socio-economic impacts;
- To provide information to communities in areas affected by the project on the environmental problems and alternatives so that they may take part in identification and assessment of the project's environmental and socio-economic impacts.

The scope of this study was restrained to the existing Nzove 1 water treatment plant and associated distribution network in Kigali City.

1.4 APPROACH AND METHODOLOGY OF THE STUDY

This study followed procedures stipulated in the Law on environment, Ministerial order establishing the list of projects that must undergo an EIA and AfDB Environmental and Social safeguards procedures, General Guidelines and Procedures for Environment Impact Assessment. The study adopted the following approach:

(i) scoping study/ preliminary assessment,
(ii) review of secondary data on baseline information
(iii) review of policies and regulations,
(iv) review of previous meetings and consultations with stakeholders,
(v) interviews with key stakeholders, and
(vi) field surveys along the entire project sites, to gather information and data on various aspects of the project site.

Site locations, land cover, and proposed infrastructure were described fully with clear maps for a comprehensive understanding of the area and project activities and to make the task of planning and monitoring easier during the implementation of the mitigation measures for the identified impacts. The methodology is detailed hereafter.

1.4.1 Preliminary Assessment/ Scoping study

A scoping study was done involving consultation with the client (WASAC), technical staff, local communities and affected people in Kanyinya Sector.

The scoping exercise entailed a preliminary visit to the various sites for the following reasons:

- Site reconnaissance to understand the spatial coverage of the project;

- Identification of the likely stakeholders who will be involved in the public consultation, affected or benefitting from project activities;
- Preliminary findings of the existing environment; (primary, biological and socio-cultural environment);
- Preliminary predictions of likely positive and adverse impacts;
- And finally establishing clear boundaries of the study and focus on the relevant issues concerning the study.

The scoping study also involved literature review on; existing similar ESIA report, Project detailed designs and other technical documents, National Water Supply Policy, other water related sector policies and regulations, National Strategy for Transformation (NST1 2017-2024), Rwanda Vision 2050 and African Development Bank Environmental and Social Safeguards Procedures.

The law on the environment, project related policies, among others, review of Institutional, Legislative and Policy framework. An intense deskwork was done of existing institutional legislation, policies, plans and programme, which might influence the implementation of the project, maintenance and enhancement of the environmental resources.

1.4.2 Consultation with Stakeholders

Involvement of Stakeholders

The study applied different participatory methods, namely interviews, one-to-one discussion, focus group discussions and official meetings with stakeholders as stipulated in the Terms of Reference (ToR). The consultation was first conducted with WASAC staff, *the developer/ proponent*, to get the details of the proposed project activities. Stakeholders consulted were informed on the proposed project and asked to raise their concern on the proposed project.

Identification of Stakeholders' Concerns

The stakeholders pointed out a number of issues and concerns. Any issue raised by one individual or a group of people was cross-checked by discussing it over with other individuals or groups. Concerns raised by stakeholders are summarized in Chapter five.

1.4.3 Baseline Data and Information

Information on the physical, biological, socio-economic environment, institutional and legal regimes was collected from a variety of sources, namely, detailed designs of the project, the concept design project and general literature review, visual and inspection, expert opinion, consultations with selected stakeholders and discussions with WASAC representatives.

Field data / information collection

This involved visits to the site earmarked for the project components and activities. The Consultant was accompanied to the sites for the scoping visit, by WASAC staff. Subsequent field surveys were done to capture a broad picture of the prevailing situation at the site. Activities included:

i. Appraisal of physical and environmental conditions of the project site and areas that may be impacted by or may have influence on the proposed project activities and its associated facilities and services, namely; water, climate, topography, soils, drainage/hydrology, flora, fauna, etc.
ii. Appraisal of adjacent land use, alternative sites or technologies for the project and assessment of other relevant socio-economic parameters.
iii. Understanding the detailed project description through comparison of the field survey and the preliminary technical study.
iv. Opinions of locals on the project, their opinions on likely positive and adverse impacts, proposals on mitigation measures to adverse impacts.

1.4.4 Impacts Assessment

The environmental and social impacts assessment was done by superimposing project elements onto the existing environmental conditions of the project site. Environmental impacts were then identified, their significance assessed and mitigation/enhancement measures proposed. Simple matrices and Consultant's expert judgement were used to assess the impacts.

1.5 REPORT STRUCTURE

This report is organised in fourteen chapters. Chapter 1 gives a general background of the project; Chapter 2 deals with the project description, Chapter 3 gives a description of pertinent policy, legal and institutional framework within which the project will operate; and Chapter 4 presents the baseline data, environmental conditions, biological environment and socio economic profile of the project areas. Chapter 5 provides the project alternatives and the selected one, Chapter 6 presents the findings of the Stakeholders' consultation and public participation. Impacts identification, evaluation for significance and proposed mitigation measures are elaborated in Chapter 7, while Chapter 8 and 9 presents the Environmental and Social Management Plan and Environmental and Social Monitoring Plan respectively. Additional Plans are presented as Chapter 10 for the Contingency Plan, Chapter 11 The Community Health, Safety and Security Management Plan, Chapter 12 the Traffic Management Plan, Chapter 13 the Chance Find Procedure. Chapter 14 concludes the report and presents the Recommendations.

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT AREA

2.1.1 Location

The project is located in Nzove Cell, Kanyinya Sector in Nyarugenge District of Kigali City.

2.1.2 Existing features observed

The project is located in urban area and is accessed from the national road Kigali - Musanze and connected to murrum roads to access the project site. The project area is mainly flat with gentle slopes in most of the areas.

2.1.3 Overall Adjacent Developments

The proposed project sites are located within urban area with major development activities such Skol factories, garages, residential areas, commercial areas, schools, health center, local authorities' offices (cell, sector offices), churches, markets, agricultural farms with irrigation facilities and adjacent to Nyabarongo river.

Figure: Nzove WTP complex in located in mixed land used area

2.2. PROJECT ACTIVITIES AND COMPONENTS

2.2.1. Construction phase

Activity	Detailed process /Activities
Site Clearing and Stripping	This involves clearing the project site in preparation of construction works. Stripping shall include top soil removal, levelling etc;
Excavation:	Ground and trench excavation will be done according to the site layout plans and the design of the unit.
Procurement and delivery of construction materials;	All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies and with Rwanda Standards Bureau specifications. It is worthwhile noting that most of the construction materials are locally available.
Foundation:	Foundation preparation for all the construction works;
Backfilling	Filling of trenches and other areas to ensure level surfaces after compaction. The fill material shall be compacted by mechanical means until the required degree of compaction;
Disposal of construction wastes;	Construction wastes to be recycled and reused as much as possible e.g. Donate recyclable/reused or residue materials to the local community, groups, institutions or residents , Disposal of the wastes will be done responsibly by dumping at designated dumping site this will be collected by a contracted waste management company.

2.2.2. Operation Phase.

Activities planned in this phase are mainly:

- ✓ Completion of construction activities will be followed by operation of the project (Water Treatment Plant)
- ✓ Both solid and liquid wastes will be produced during this phase of the project. Solid waste handlers will be contracted to collect and dump wastes in approved dumping sites.
- ✓ Storm water will be conveyed to the storm water drainage system that will have been developed.

Project Waste Generation and disposal.

TYPE	WASTE/Quantity	Source	DISPOSAL Method
Solid	Unknown	building operation	Waste bins, and collection to the city dumping site.
Air Emission	Unknown		Into the atmosphere

Table 1: Project waste Source and Disposal methods

2.2.3 Project Decommissioning.

Decommissioning of the proposed project will become necessary when the project completes its life cycle or when there is change of use. In a situation where the buildings complete their lifecycle, decommissioning process will typically involve demolition of the facility, clearing of the site and reclaiming or restoring the affected land into a natural condition.

During decommissioning, buildings, pavements, drainage systems, parking areas and perimeter fence will be demolished in order to restore land to its original state. Different kind of workers and equipment's will be deployed to carry out these tasks. This will produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company. Electrical installations, sewerage system, pipes among others will be dismantled during decommissioning of the project. The proponent is expected to recover most materials for sale or future use. Those that are obsolete or greatly damaged shall be disposed in authorized dumping site and incinerate some to reduce their volume in the environment.

Decommissioning will also entail restoring the project area to its original state. Activities during restoration include removal of debris, landscaping, planting of trees and removal of barriers among others. It will be upon the proponent and the contractor to ensure restoration is done in an orderly manner.

The implementation of the decommissioning activities will require the development of a plan of Works for the whole site will entail the following:

a) Equipment hygiene practices.
b) Removal of all infrastructure;
c) Removal of all non-hazardous materials and wastes;
d) Monitoring of surface and ground water during decommissioning period and for at least three years after rehabilitation.
e) Leave naturally regenerated native vegetation undisturbed where possible.
f) Spread substrate mix over prepared landform to a minimum depth of 300mm.
g) Use local native vegetation in the re-vegetation.
h) Monitor re-vegetation for at least three years.

➲ **Decommissioning Activities.**

Demolition works.

Upon decommissioning, the project components including WTP, pavements, drainage systems, and perimeter fence will be demolished. This will produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company.

Dismantling of equipment and fixtures

All equipment including electrical installations, finishing fixtures, pipe-work among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipment in other projects. Those that are obsolete or greatly damaged shall be disposed in authorized dumping site and incinerate some to reduce their volume in the environment

Site restoration

Once all the wastes resulting from demolition and dismantling works is removed from the site, the site will be restored through and re-vegetation using indigenous plant species. Restoration of the affected land may involve the filling in of the open pits and grading the land to its natural contours, replenishment of the topsoil and finally planting appropriate tree species and under cover vegetation to hold the soil in place and to prevent flooding.

Positive Impacts during Decommissioning Phase

Site Rehabilitation

- ✓ Employment Opportunities

Negative Impacts during Decommissioning Phase

The demolitions of the whole of the WTP after the end of its life span will lead to the below mentioned environmental impacts whose risks need to fully be identified and methods to prevent or minimize risks be put in place. This could be done through undertaking a decommissioning study. Amongst the key impacts expected are:

- ✓ Noise Pollution and Vibration.
- ✓ Dust emissions/Air Pollution.
- ✓ Occupational health and Safety Issues.
- ✓ Water Pollution.
- ✓ Solid Wastes and other Materials.
- ✓ Traffic Impacts

2.3 Project components

The current status of Nzove I indicates that the whole system need to be rehabilitated. In fact the existing wells that were designed to produce 40,000m3/d are only providing around 13,000m3/d and therefore need to be rehabilitated and the field upgraded while the civil infrastructures on WTP as indicated on the figure below are damaged and need rehabilitation. Similarly, other components such as the water treatment process need rehabilitation as well as the transmission line.

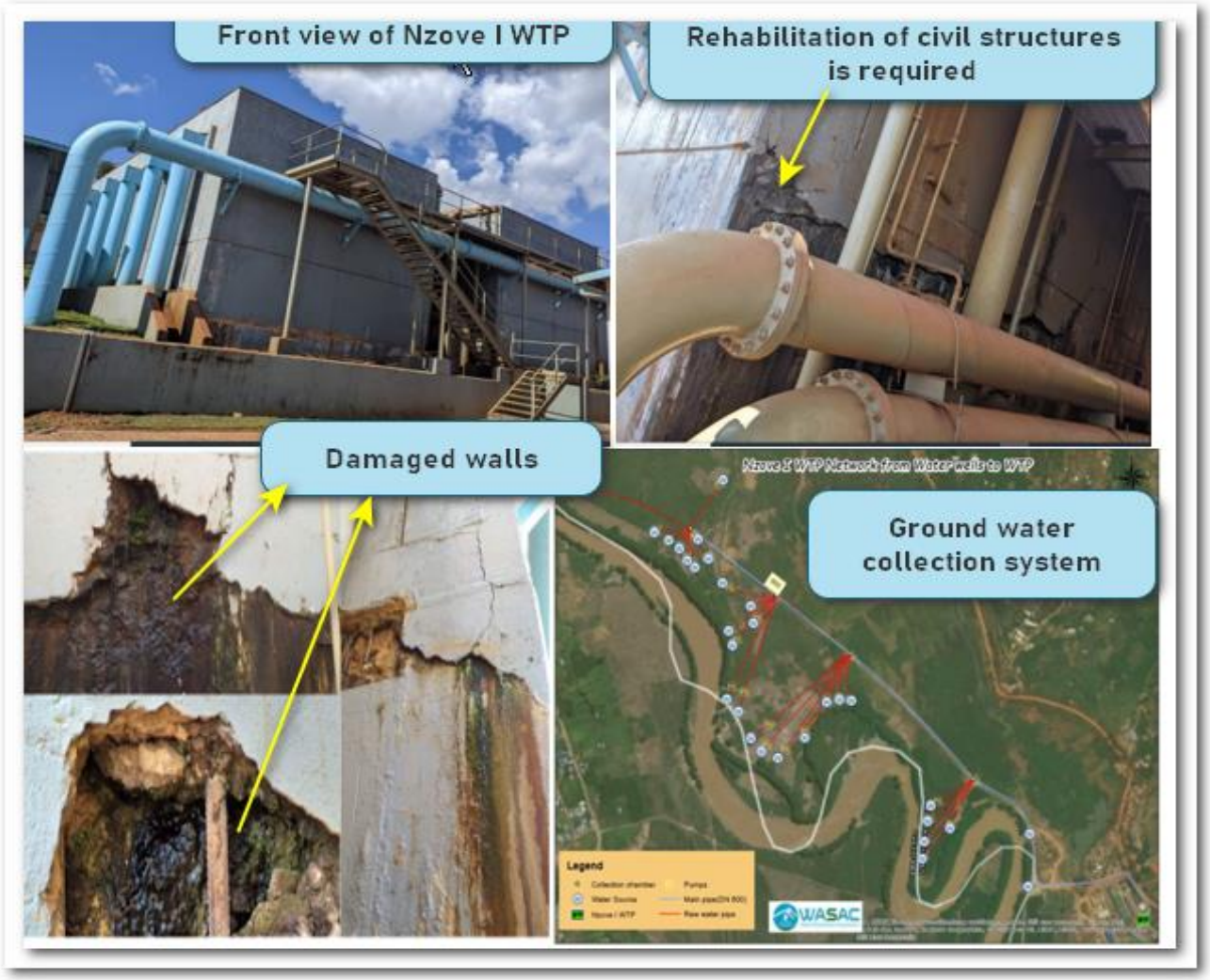


Figure : Photo of Main components of Nzove I water supply system to be rehabilitated

The components of Nzove I WSS scheme comprise the following infrastructures to be rehabilitated under the current project:

Groundwater water abstraction from Nzove well field.

- 58 (10 rehabilitated & 40 newly developed) boreholes with a total potential of 56,205 m3/d (only 42,105m3/d to be extracted sustainably).
- 9.8 km long pipelines (raw water collectors, manifolds and transmission), with varying diameters from 150mm to 600mm.
- Nzove I Water Treatment Works with total capacity of 42,105, m3/d.
- Nzove I Pumping Station with all civil infrastructure and ME components (Backwash pumps - 1,200m3/h, Low lift pumps – 32,105m3/day, & High lift pups - 40,000m3/day).
- Air blower station with 780m3/h capacity.
- 8,8km long DN600 clear water transmission.

2.2.1 Well field

Under the ground water development, the well field activities shall consist of:

- Ground water Investigation
- Development of a well field with production capacity of 42,100m3/d. This include development and construction of 58 boreholes (10 are existing to be rehabilitated while 48 are new) Rehabilitation of existing boreholes
- Drilling of new boreholes. Each borehole expected to be 16m deep, water to be pumped to a riser pipe, average yield between 6.5 and 12.2 L/s and average dynamic water level between 5 and 7 mgbl
- Development and installation of pumps. The average elevation in the well field is 1348.22masl compared to the destination of raw water (WTP) being at 1364masl.

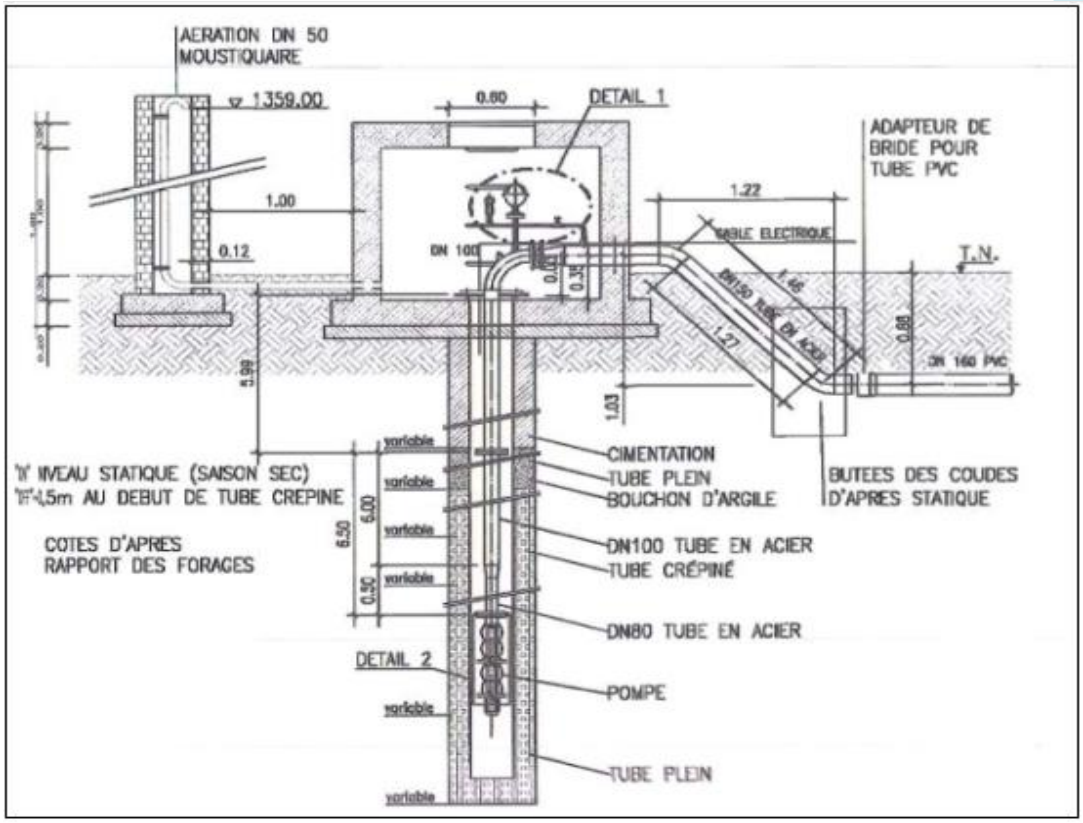


Figure: Approved borehole design for well field groundwater developmnent

- Borehole submersible pumps for lifting from boreholes dynamic water levels to spray aerator

In addition, each borehole has been designed to have the following components:

i) A fence size of 13.4 x 12.4m with gate for well protection
ii) A drainage system around the borehole site
iii) Access road for operation and maintenance of the well
iv) A water tap for sampling, supply services and watering the garden compound
v) Reinforced concrete chamber size of 2.0 x 2.0 m for well head protection. The chamber height to be extended up to 1350.5 masl (0.62m above the maximum blood level)

2.2.2 Pipe works (raw water collection, transfer and protection)

The water from the well field of average elevation 1348.23masl is expected to be pumped through a system of collection pipes, manifolds & raw water rising mains to the spray aerator installed on the top of plant at the elevation of 1364masl. The raw water rising main has a nominal diameter of 600mm and designed to transport 487.33l/s.
This collection pipework system consists of:
1) Riser pipe for conveying water from submersible pumps to subsidiary laterals;
2) Lateral pipes, for conveying water from riser pipes to raw water transmission;
3) Raw water rising main for conveying water from laterals to spray aerator;
4) All the 4 existing connection chambers can be utilized to connect all the boreholes to be developed in the north-western part of the well field.

Pipe work activities shall consist of:

- Refurbishment of laterals and collector pipes
- Excavation to 1.5 depth trench for pipes
- Install new pipe lines
- Backfilling, compaction
- River crossings / Pipe jacking under rivers
- Reinstatement of vegetation

The study design has also recommended to:
It is recommended:

- To construct well head protection concrete chamber on top of each well head.
- To install 7.96km long collector pipes (DN160 to DN500) with valve and connection chambers to collect raw water from the 58 boreholes.
- To rehabilitate the existing 1,485m long DN600 DI pipeline.
- To construct nine new control panel rooms.
- To construct eleven new guard towers adjacent to the respective control rooms.
- To construct one surge vessel seat.

Figure: Groundwater collection pipeline (Red: Raw water pope from each borehole to the raw water collection pipeline passing to the collection chamber)

2.2.3 Connection chamber and control rooms

Four connection chambers will be required to connect collector pipes from the respective cluster of boreholes. The chambers will also serve as valves and meters rooms as well as a support for surge tank and control panel rooms. It is proposed to construct 9 new pump control rooms attached with guard towers. They shall have minimum internal dimensions not less than 4.0m length, 3.30m width, 2.60m height.

2.2.4 Electro-mechanical, control & Automation

2.2.4.1 Boreholes submersible pumps

The submersible pumps are designed to lift water from the boreholes average dynamic depth of 5 to 7 mgbl and pump position of 10 to 13 mgbl for rehabilitated and new boreholes respectively to Nzove I WTP aerator located at 1364masl.

2.2.4.2 Power supply

The general power supply scheme will be that of REG, providing 15Kv OR 33kV high voltage at each pump control panel site via overhead lines. The power will be stepped down to 380 v at each location (control panel). While there is existing line and transformer erected up to control panel 4. For new boreholes the length of electric transmission lines will be: (i) 11.280m for control panels 4 to 6 to be laid from a pole near

control panel 4; (ii) 50m for control panel 11 to be laid from a pole near Nzove II WTP; (iii) 710m for contro panel 7 up to 10 to be laid from a pole near Nzove II WTP.

Figure: Electric line to be supplied to new borehole for raw water pumping and to other facilities

2.2.4.3 Remote communication/Telemetry /SCADA

The SCADA system shall be designed to enable operators to monitor the status of the entire pumping system (of all boreholes submersible pumps at well field) from the existing SCADA control room at the WTP. The new telemetry shall be integrated with the existing control system at Nzove I WTP.

2.2.5 Rehabilitation of Nzove I Water Treatment Plant

2.2.5.1 Assessment done on the existing status Nzove I water treatment process Nzove I WTW Components for proposal Rehabilitation required

- Nzove I WTW, after major rehabilitation, will be capable of treating 42,105m3/day. About 2,732m3/day is expected to be used for backwashing 14 filters and chemical solution Preparation
- The treatment process/units are:

i) Aeration with spray aerator;

ii) Oxidation and removal of Iron & manganese with 8 Nos. biological filters;

iii) Intermediate tank (1000 m3)

iv) Filtration with 6 Nos. Rapid Gravity Filters

v) Post chlorination with chlorine injection on DN600 pipe

vi) Clear water tank (2000 m3).

- In general, the treatment process in place is proper and should be adopted for treating

the proposed capacity.

- Biological Filters
- The biological filters, after proper rehabilitation, are hydraulically adequate for treating the design flow of 42,105 m3/day.
- The filtration rate is within acceptable range (5 - 8 m/hr). Filtration rate will be 5.62 m/hr when all filters are operating and 6.42m/hr when one filter is out for backwashing.

- The gravel media depth should be limited to 1.50 m so that adequate falling height is maintained for aeration.
- The sizes and thicknesses of all structural elements are found to be safe.
- Over the past number of years, a large number of cracks have appeared in the structure, many between the filter slab (the slab containing the nozzles) and the filter walls. Some of these cracks have opened up into relatively large gaps, a clear indication of structural problems.
- These structural problems can probably be attributed to poor construction methods, like bending away of reinforcement, as well as possibly overloading, by too high backwash pressures.
- The structures can be salvaged and that technologies exist to repair the structural damage.
- Intermediate tank: The existing 1000 m3 intermediate tank is hydraulically adequate to serve both as a storage for backwashing the biological filter (1,561m3/day) and a sump for pumping (40,544m3/day) to the rapid gravity filter.
- The intermediate tank is found structurally sound and doesn't requires robust refurbishment like the filters.
- Low Head Transfer Pump: The existing three low head pumps are adequate to be used.
- Rapid Gravity Filters
- The rapid gravity filters, after proper rehabilitation, are hydraulically adequate for treating the design flow of 40,544 m3/day.
- The filtration rate are within acceptable range (5 - 10 m/hr). Filtration rate will be 7.21 m/hr when all filters are operating and 8.66m/hr when one filter is out for backwashing.
- The sand media depth should be limited to 0.70 m so that adequate free board of 0.30m and maximum water depth of 1.95 m is maintained.
- The sizes and thicknesses of all structural elements are found to be safe.
- Similar structural problems like the biological filters have been observed
- Backwash Water Pumping: The existing three backwash pumps are adequate to be used for pumping back wash water for both biological filters and rapid gravity filters.
- Air Blowers: There existing four air blowers in the blower shade located are in good condition and can continue to be used.
- Clear Water Tank: The existing 2000 m3 clear water tank is hydraulically adequate to serve as a storage for backwashing the rapid gravity filters (1,171m3/day) and a sump for pumping (39,373m3/day) to Ntora reservoir. The same reservoir could also provide adequate chlorine contact time of 61minute. The clear water tank is found structurally sound and doesn't requires robust refurbishment like the filters.
- Recovery System: The existing recovery tank, with dimensions 20 m length, 19.8m width, and 2.20m Height, is hydraulically adequate and the structure is in good condition.

2.2.5.3 Based on assessment and analysis of Nzove I WTW, the following are recommended on the unite processes and components:

- Aeration System (Spray Aerator): The Contractor has to assess the physical situation of the manifolds and nozzles and make minor modification to the aerator system installed on all the 8 biological filters.
- Biological Filters

The repair of the structural damage is highly specialized work and should only be carried out by specialist contractors with experience in the field. It requires meticulous removal of all damaged concrete up to an undamaged face and repair and corrosion proofing of all the reinforcing steel prior to covering the damaged portions with specialist mortars containing epoxies.

Repair work will most likely involve the following:

- Cutting out spalled and poor-quality concrete and repair with an epoxy based mortar.

- Cleaning rusted rebar and painting with rust inhibitor
- Strengthening the structure with extra rebar/or dowels, or stainless-steel supports.
- Intermediate tank: the Contractor should be advised to inspect the structure including the pipe work and recommend the necessary rehabilitation measures. For this purpose a provisional sum should be included in the bill of quantity.
- Low Head Transfer Pump: The Contractor should be advised to inspect the pumps including the pipe work and recommend the necessary rehabilitation measures. For this purpose, a provisional sum should be included in the bill of quantity.
- Rapid Gravity Filters: Similar structural problems like the biological filters have been observed.
- Backwash Water Pumping: The Contractor should be advised to inspect the pumps including the pipe work and recommend the necessary rehabilitation measures. For this purpose, a provisional sum should be included in the bill of quantity.
- Recovery System: The Contractor should be advised to inspect the structure including the pipe work and recommend the necessary rehabilitation measures. For this purpose, a provisional sum should be included in the bill of quantity. Two pumps each with discharge 191m3/day and head 27.7m has to be installed in order to recover backwash water from BF & RGF. In addition, a pump shelter with 5m in length, 3m width and 1.5m

2.2.5.3 Rehabilitation of civil infrastructure on the WTP

The following activities have been recommended for rehabilitation of Nzove I WTP:

- Cutting out spalled and poor-quality concrete and repair with an epoxy-based mortar
- Cleaning rusted rebar and painting with rust inhibitor
- Strengthening the structures with an extra rebar/or dowels, or stainless steel supports

The details for these works include:

i) Cleaning of all concrete surfaces and marking of hollow areas

ii) Hammer testing of all concrete surfaces and marking of hollow areas

iii) To do a cover meter survey to determine the concrete cover to reinforcement.

iv) Cutting out of loose and hollow concrete in accordance with specifications. Cut out to 10mm behind any rebar (where applicable), cut the first 10mm perpendicular to surface so as to prevent "feather edging". Clean rebar to a "bright steel" condition.

v) "Priming" of old concrete surface with an approved primer, depending on the type of grout that will be used.

vi) Apply an approved corrosion inhibiting "paint" to all exposed reinforcement

vii) Fill all cut-outs with an approved repair mortar, like Sika Monotop 610; Use different types of grouts for either vertical or horizontal application and depending on the thickness of repair.

viii) All repaired surfaces to be cured for 7days as per manufacturer's recommendations

ix) Cracks that are too small for repair, mortars must be repaired by crack injection methods.

x) Connections between walls and filter slab to be strengthened by Epoxy-dowelling of bars

xi) To insert extra vertical supports between the filter slab and the foundations. These will be in stainless steel pipes and must be able to act both in compression as well as in tension during backwashing.

xii) Depending on the results of the cover meter survey and the carbonation depth, it may be required to apply a protective coating to all concrete surfaces

2.2.6 Rehabilitation of clear water transmission main

The hydraulic analysis of the Rising Main shows that it is capable to carry a flow of 455.71 l/s (39,373 m³/day). For its size (600mm) and age it could develop a maximum velocity of 1.61 and a head loss of 4.23 m/km of its length. Which are within acceptable limits. The transmission main is to deliver water, at relatively high velocity, from clear water tank at Nzove I WTP to Ntora reservoirs. Connecting these pipes with distribution systems will involve significant costs in terms of control valves as well as difficulties in operation and maintenance. The pipe details are : Length of pipeline is 8.9 Km; Class K9 ductile iron; Wall thickness of 9.8mm with cement mortar lining; Effective internal diameter of 600mm; pressure rating of PN40. The rehabilitation works for the pipeline are:

i) Surge vessels: Surge vessels to be inspected, tested and serviced prior to installing higher capacity pumps; they mau require new coat of high-quality protective coating; All valves/meters and fittings associated with surge vessel to be tested and replaced if not operational.

ii) Air valves: Clean and service all air valves; Replace any air valve that are not fully operational; Clear air valve chambers and repair structures where needed; Repair locks/replace and secure air valves.

iii) Pipes: All pipe to be inspected for external corrosion or physical damage; pipes in culverts or on bridge supports to be inspected and external coatings applied where deemed necessary; Bridge supports to be inspected and reinforced where settled or damaged by floods/debris. Exposed flanges or bolts to be protected using suitable Denso tape/putty or similar approved.

iv) Meters & gauges: they are to be thoroughly inspected during the pre-construction. Any of these facilities found faulty will be refurbished or replaced with calibrated equipment to the defined standard.

2.2.7 Nzove I WTP pumping station

- The existing pump house with Internal dimensions of 33.90m length, 7.30 m width and 5.38 m height provides good space for all equipment required in the pumping station and is also structurally in good condition.
- The existing six high lift pumps are adequate to be used.
- The existing Surge Vessel is adequate to be used. Activities recommended, but not limited, are:
  i) Surge vessel at HLP to be inspected, tested and serviced prior to installing higher capacity pumps
  ii) Surge vessel may require new coat of high-quality protective coating
  iii) All valves/meters and fittings associated with surge vessel to be tested and replaced if not operational

2.2.8 Remote Communication / Telemetry / SCADA

It is recommended:

- To implement a new telemetry system at each of the main components of the treatment plant and pumping station communicating via radio (digital of the GE SD4 type) with central SCADA system at the Administration building.
- That the Contractor design and implement a SCADA system to enable operators to monitor the status of the entire pumping system from the existing SCADA control room at the Treatment Plant.
- To integrate the new telemetry with the existing control system at the Nzove WTW.
- To configure the system into a number of displays, generally consisting of graphic overviews, historical trends and alarm status.
- To setup, a data logging system to monitor all the analogue values coming from submersible borehole pumps for level, flow, temperature, pressure and water quality.

2. 2.8 Construction method

The construction method to be applied to the execution of this project for the rehabilitation of Nzove 1 consist in a combination of a mechanized and manual methods. This because some of the works like wellfield development by boreholes drilling, concrete mixing, soil excavation, etc will be executed by machines with only few staff to makes required commands on the machine. On the other side some works works like masonly works, welding , electrification , internal finishing's, etc will be executed manually by manpower to be hired.

2.2.9 The materials and equipment required for project implementation

During construction activities

No.	Equipment Type and Characteristics	Minimum Number required
1	Trucks to transport pipes and construction material	**1**
2	Dumper Trucks (load capacity ≥ 15 m³)	**1**
3	Excavator ≥ 130hp, bucket ≥ 1,5m³) for only lot 6	**1**
4	Self-loading concrete mixer (≥ 500 litres)	**1**
5	Pick up for transport staff (≥ 4WD)	**2**
6	Topographic survey equipment (New)	**3Total stations, 3 Dump level, 3 GPS**
7	Drawing software and equipment AutoCAD, ArcGIS or equivalent, plotter, computers	**1**
8	Drilling machine	**1**
9	Drilling Surveying camera	**1**
10	Concrete sampling and testing material set	**1**
11	Geotechnical sampling equipment set	**1**
12	Pressure testing equipment's (set)	**1**
13	Concrete vibrators (≥ 3 hp/6 cm)	**2**
14	Dewatering pumps (≥ 15 m³/h)	**2**
15	Generator (≥ 20 KVA)	**2**
16	Truck Water Tank (≥ 10 m³ or 10000 liters)	**1**
17	Fully hydraulic truck crane (≥ 100,000 kg/30,000kN.m)	**1**

- This list is not exhaustive; the Contractor may provide additional equipment it deems necessary to complete the works within the contractual period
- All equipment's age shall not exceed ten (10) years.

In addition to the equipment to be used, the construction activities will require a number of materials that will be used to execute works as indicated in the table below:

S/N	Material	Use	period of need and use	Source of supply
1	Sand	For concrete and masonry works	Construction, Operation and maintenance	Available in many quarries in Rwanda
2	Stones	For foundations and other masonry works	Construction	Available in many quarries in Rwanda
3	Other aggregates	For concrete and masonry works	Construction	Available in many quarries in Rwanda
4	Cement	For concrete and masonry works	Construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
5	Paints	Finishing works	Construction and operation &maintenance	Manufacturing factories in Rwanda and in the region with access to Rwanda market
6	Steel bars	Concrete works	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
7	Metallic tubes	Roffing, doors, windows,etc	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
8	Ceramic tiles	For interrior finishing	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
9	Pipes	for pipeline networks constrution and plubling and sanitary works	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
10	Chemicals such as lime and chlorine	Water treatment	operation	International manufacturing companies
11	Pumps	pumping water to the the higher elevation destination	operation	International manufacturing companies
12	Lifting crane	For operation and maintenance in the submersible pumps system	operation	International manufacturing companies
13	generator	Back up during power cut	operation	International manufacturing companies
14	Petroleum derivatives	To run generator	operation	Locally available from traders
15	Protective equipments such as gloves, overals, goggles, etc	For safety of personel on work	operation	International manufacturing companies
16	Tiles	for roof coverage	construction	Manufacturing factories in Rwanda and in the region with access to Rwanda market
17	Electric wires	Electrification of premises	construction	Locally available
18	stailness steel metals	all structures that shall be in permanent contact with water in the WTP, tanks and other systems	construction	International manufacturing companies
19	Fittings for water network	connection, jointing, branching, embeddment, etc in the water supply system	construction	International manufacturing companies

The raw materials like cement, sand, stones, etc. for civil works shall be purchased locally. In fact there are a number of quarries that are certified to supply sand and stones in many parts of Rwanda as well as cement, paints, stell bars, electric wires, etc. manufacturing factories in the country and in the region. Similarly, pipes manufacturing companies are available in the country and in the region and the supply will be subjected to the selection based on the highest quality condition. It is worth recalling that some other materials like pumps, fittings for large pipes, chemicals for water treatment plants such as chlorine and its derivatives for disinfection etc are to be supplied from international companies or manufacturers. As they are not locally available whereas lime can be found in the region.

During operation

Based on the treatment process to be used , being only,, aeration pH regulation and disinfection, the following chemicals will be required.

• Treatment: Lime $Ca(OH)_2$
•Disinfection:
-Calcium hypochlorite $Ca(OCl)_2$.
-Sodium chloride (Nacl): in electrolysis and gives the final used product called Hypochlorous acid

During operation

The following chemicals will be purchased

• Treatment: Lime $Ca(OH)_2$
•Disinfection:
-Calcium hypochlorite $ca(OCl)_2$.
-Sodium chloride (Nacl): in electrolysis and gives the final used product called Hypochlorous acid

- **Source of materials**

All construction materials will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies and with Rwanda Standards Bureau specifications. It is worthwhile noting that most of the construction materials are locally available (eg: sand, stones and all aggreagates for masonry and concrete works will be the form the locally approved quarries). Moreover, other construction materials for this project such as cement, pipes, steel bars, ceramic tiles, etc) will be obtained from the local manufacturers after testing the compliance with quality requirements.

Other materials and equipment that are not manufactured locally such as chemicals for water treatment process, fittings for pipelines, electromechanical equipments (pumpS, SCADA, etc) shall be supplied from international manufacturers

- **Estimated number workers:**

During construction phase, the total number of personnel to be employed will range from 400-500 and will be composed of formally educated and informally educated, women and men.

During operation phase the total number of 30 staff will be required to operate the plant and will work regularly while the casual workforce will range from 60-80.

CHAPTER 3: RELEVANT POLICY, LEGAL AND INSTITUTIONAL ARRANGEMENTS

3.1 INSTITUTIONAL FRAMEWORK

The institutional framework for environmental management is currently enshrined in the Organic Law determining the modalities of protection, conservation and promotion of the environment in Rwanda, published in the Official Gazette RWA Nº 9 of the 1st May 2005, particularly in its chapter III relating to the establishment of the institutions.

3.1.1 Ministry of Infrastructure (MININFRA)

The mission of the Ministry of Infrastructure includes:

- To put in place policies and implementation strategies to achieve the national agenda and targets in the sector of water and sanitation as well other sectors of infrastructure.
- To initiate programs aimed at increasing access to affordable energy, water and sanitation, and transport infrastructure and related services for the population;
- To supervise the implementation of quality standards and norms, cost effectiveness, response to environmental sustainability, safety and cross-cutting issues in infrastructure development;
- To work towards implementation of programs to enhance human resource capacities under the transport, energy, habitat & urbanism, water and sanitation, and meteorology sub-Sectors respectively;
- To supervise activities meant to elaborate, monitor and assess the implementation of national policies and programs on matters relating to habitat and urbanism, transport, energy, water and sanitation.

With the above mentioned mandate of MININFRA, the ministry will continuously monitor the implementation of this project in compliance with the policies and provide advocacy wherever required for the progress of the project in technical and financial matter.

3.1.2 Water and Sanitation Corporation (WASAC Ltd)

WASAC Ltd is the entity setup to manage the water and sanitation services in Rwanda and was created by the law Nº 87/03 of 16/08/2014. The company was created to deliver water and sanitation utility sufficiently focused to deliver new infrastructure; efficient and effective service delivery; build a strong people capability; and meet key national milestones. It is expected to reverse the status quo that includes inadequate. WASAC is the implementer of the project since the initiation of the project, the study and the institution will be responsible with implementation of the project in compliance with policy, legal, regulatory and standards requirement so that the project will achieve the intended objectives.

As implementing agency, WASAC Ltd will play a critical role in project implementation but also in the implementation of ESMPs and ARAPs as well as conditions of approval to be issued by Rwanda

Development Board. WASAC Ltd is also responsible for monitoring of the implementation of mitigation measures and report back to Rwanda Environment Management Authority.

3.1.3 Ministry of Environment (MoE)

The Ministry of Environment is responsible for the development of environmental policies and procedures (including impact assessments), protection of natural resources (water, land, flora, and fauna), environmental legislation, biodiversity, and other environmental aspects. The Chapter IV of the organic law on environmental protection, conservation and management, Article 65, clearly calls for the need to subject projects to mandatory ESIA. The Article 65 further specifies that every project shall be subjected to environmental assessment prior to its commencement. It shall be the same for programs, plans and policies likely to affect the environment. Specific details of projects referred to in this Article shall be spelt out by the order of the Minister in charge of environment. MoE is one of the lead Agencies / Line Ministry as provided by the General Guidelines and Procedure for ESIA.

MoE is expected to perform the following functions in the ESIA process whichalso concern the current project for rehabilitation of NZOVE I WTP:

- Participate in screening at the request of Rwanda environment Management Authority (REMA);
- Publish the list of ESIA practitioners;
- At the request of REMA, review Project Briefs so as to advise on Terms of Reference;
- Ensure that their own projects adhere to ESIA requirements;
- Ensure that private-sector projects in fields over which they have jurisdiction comply with ESIA requirements;
- At the request of REMA, review ESIA report;
- Serve on REMA's Technical Committee;
- Serve on REMA's Executive Committee;
- Provide information or advice to developers and ESIA Experts during ESIA process;
- Participate as panelist at public hearings held during the conduct of ESIA;
- Advise developers on the requirement for ESIA (where relevant) before licensing their projects;
- Assist in inspecting and monitoring environmental compliance by ensuring that licensing terms and conditions are met, including those specified by REMA.

3.1.4 Rwanda Environment Management Authority (REMA)

REMA was established in 2004 to act as the implementation agency of environment related policies and laws in Rwanda. Under supervision of the Ministry of Natural Resources, from the Law n°63/2013 of 27/08/2013 determining the mission, organization and functioning of REMA, it has the legal mandate for national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment and climate change. Key responsibilities of REMA related to this project are as follows:

- Advise the Government and project implementers on policies, strategies and legislation related to the management of the environment as well as the implementation of environment related international conventions, whenever deemed necessary;
- Conduct thorough inspection of environmental management in order to prepare a report on the status of environment in Rwanda that shall be published every two (2) years;
- Conduct inspection for compliance with the conditions of approval of EIA certificates issued by RDB for projects going to implementation and this is the key role related to this project.
- Closely monitor and assess development programs to ensure compliance with the laws on environment during their preparation and implementation;
- Prepare, publish and disseminate education materials relating to guidelines and laws relating to environmental management and protection and reduce environmental degradation risks;
- Monitor and supervise impact assessment, environmental audit, strategic environmental assessment and any other environmental study. REMA may authorize in writing, any other person to analyze and approve these studies. The ESIA review has been delegated to Rwanda Development Board.

3.1.5 Rwanda Water Resources Board (RWB)

The Rwanda Water Resources Board was established under the Law N°06/2017 of 03/02/2017 establishing the Rwanda Water and Forest Authority and determining its mission, organization and functioning. The Authority has the following main mission:

- To implement policies, laws, strategies and Government decisions related to the management of natural water resources;
- To advise Government, monitor and coordinate the implementation of strategies related to the management of natural water resources;
- To assist public and private institutions in charge of management of natural water and needing the exploitation of water resources
- To assist in the establishment of standards and regulations relating to the management of natural water resources.

In addition, RWB ensures that the process for request of abstraction permit for raw water fulfil the requirements specifically the issue of conflict of use with other users and the required environmental flow.

3.1.5 Rwanda National Land Use Authority (NLA)

Rwanda National Land Use Authority (NLA) is responsible to establish and operate an effective land administration system that secure land ownership, encourages investment in land in order to improve socio- economic conditions and reduce poverty in Rwanda. NLA is

also responsible to develop methods and technics that ensure the protection of land resources. During this project implementation, all land transfer from the current owners to the project implementer when the expropriation/ compensations will have been conducted and other and land related processes will be handled by NLA.

3.1.6 Rwanda Development Board (RDB)

RDB was created by Organic Law N° 53/2008 of 02/09/2008. It has a mission of improving the well-being of all Rwandans by fast-tracking development, catalyzing sustainable economic growth, and creating prosperity for all. This a one stop institution bringing together several government bodies in Rwanda focused at promoting investment in Rwanda. Initially the responsibility for reviewing and approving ESIA reports was entrusted to REMA, this duty has now been transferred to the newly created Rwanda Development Board (RDB) where a department of ESIA has been created and tasked with review and approvals of all ESIA reports for proposed projects and programmes before they are approved for implementation. The key responsibility of ESIA department under One Stop Centre in RDB is to:

- Receive and register ESIA Applications (Project Briefs) submitted by developers;
- Identify relevant Lead Agencies to review Project Briefs and provide necessary input during screening,
- Review Project Briefs and determine project classification at screening stage,
- Transmit Project Briefs to relevant Lead Agencies and concerned Local Governments to provide input on Terms of Reference (ToR),
- Publicize Project Briefs and collect public comments during development of ToR,
- Receive ESIA documents submitted by a developer and verify that they are complete,
- Transmit copy of ESIA Reports to relevant Lead Agencies, Local Governments and Communities to review and make comments,
- Review ESIA reports and make decision on approval, organize and conduct public hearings, appoint an officer from Authority to chair public hearings, receive public comments and compile public hearing reports,
- Appoint the Technical Committee and its representative to the Technical Committee,
- Forward ESIA Documents (ESIA Report, Environment Monitoring Plan and Public Hearing Report) to the Technical Committee,
- Chair the Executive Committee which makes final decision on approval of a project,
- Communicate decision on whether or not a proposed project is approved,
- Issue to developers ESIA Certificate of Authorization if their projects are approved.

- Forward ESIA Documents (ESIA Report, Environment Monitoring Plan and Public Hearing Report) to the Technical Committee,
- Chair the Executive Committee which makes final decision on approval of a project,
- Communicate decision on whether or not a proposed project is approved,
- Issue to developers ESIA Certificate of Authorization if their projects are approved.

3.1.7 Rwanda Standards Board (RSB)

Rwanda Standards Board (RSB) established by the Law N°50/2013 of 28 June, 2013 in charge to establish and publish national standard and to disseminate technical regulations and to participate in monitoring standardization at national, regional and international level.
It provides the following functions:

- Establish and publish national standard;
- Provide legal, scientific and industrial metrology service;
- Represent the country at the regional and international standardization organizations;
- Organize training programs in the area of standardization, metrology and conformity assessment.

The construction phase of the project will need to comply with the standards related to works, materials, occupational health and safety, drinking water standards limits, etc, developed by and obtained from RSB. One of the standards applicable is the east African standard on potable drinking water quality requirements named RS EAS 12: 2018 adopted by Rwanda.

Water quality standard in Rwanda

Rwanda's drinking water standard is descried below.
Source: RWANDA STANDARD (Reference No. RS EAS 12: 2014) "Potable water – Specification"
For details, please refer to the attached documents: Annex 10.1 RWANDA STANDARD (Reference No.RS EAS 12:2018) "Potable water – Specification".

a)Physical characteristics

Table 3.2.1: Physical requirements for potable water

Sl. No.	Characteristic	Treated potable water	Natural potable water	Method of test
i)	Colour (TCU [a] max)	15	50	ISO 7887
ii)	Turbidity (NTU max)	5	25	ISO 7027
iii)	pH	6.5 – 8.5	5.5-9.5	ISO 10523
iv)	Taste	Not objectionable	Not objectionable	-
v)	Odour	Odourless	Odourless	-
vi)	Conductivity (µS/cm)max	1,500	2,500	ISO 7888

vii)	Suspended matter	Not detectable	Not detectable	ISO 11923

a) True colour units (TCU) mean 15 hazen units after filtration.

b)Chemical characteristics

Table 3.2.2: Chemical requirements for potable water

Sl. No.	Substance or characteristic	Treated potable water (mg/L max.)	Natural potable water (mg/L max.)	Method of test
i)	Total dissolved solids	700	1500	ASTM D 5907
ii)	Total hardness, as $CaCO_3$,	300	600	ISO 6059
iii)	Aluminium, as $Al3^+$,	0.2	0.2	ISO 12020
iv)	Chloride, as Cl^-	250	250	ISO 9297
v)	Total Iron as Fe	0.3	0.3	ISO 6332
vi)	Sodium, as Na^+	200	200	ISO 9964-1
vii)	Sulphate SO_4^{2-}	400	400	ISO 22743
viii)	Zinc, as Zn^{2+}	5	5	ISO 8288
ix)	Magnesium, as Mg^{2+}	100	100	ISO 7980
x)	Calcium, as Ca^{2+}	150	150	ISO 7980

c)Inorganic contaminants

Potable water shall conform to the limits of inorganic contaminants affecting safety indicated in Table 3.2.3.

Table 3.2.3: Limits for inorganic contaminants in natural and treated potable water

Sl. No.	Substance or characteristic	Treated potable water (mg/L max.)	Natural potable water (mg/L max.)	Method of test
i)	Arsenic, as As	0.01	0.01	ISO 11969
ii)	Cadmium, as Cd	0.003	0.003	ISO 5961
iii)	Lead, as Pb	0.01	0.01	ISO 8288
iv)	Copper, as Cu	1.000	1.000	ISO 8288
v)	Mercury (total as Hg)	0.001	0.001	ISO 12846

vi)	Manganese, as Mn	0.1	0.1	ISO 6333
vii)	Selenium, as Se	0.01	0.01	ISO 9965
viii)	Ammonia (NH_3)	0.5	0.5	ISO 11732
ix)	Chromium Total, as Cr	0.05	0.05	ISO 9174
x)	Nickel, as Ni	0.02	0.02	ISO 8288
xi)	Cyanide, as CN	0.01	0.01	ISO 6703
xii)	Barium, as Ba	0.7	0.7	ISO 14911
xiii)	Nitrate as NO_3^-	45	45	ISO 7890
xiv)	Boron,as Boric acid	2.4	2.4	ISO 9390
xv)	Fluoride, as F	1.5	1.5	ISO 10359
xvi)	Bromate, as BrO_3^-	0.01	0.01	ISO 15061
xvii)	Nitrite (NO_2^-)	0.003	0.003	ISO 6777
xviii)	Molybdenum	0.07	0.07	ISO 11885
xix)	Phosphates, as PO_4^{3-}	2.2	2.2	ISO 15681
xx)	Residual free Chlorine	0.2-0.5 a	Absent	ISO 7393

a :Under conditions of epidemic diseases, it may be necessary to increase the residual chlorine temporarily.

d)**Organic contaminants**

Potable water shall conform to the limits of organic contaminants affecting safety indicated in Table 3.2.4.

Table 3.2.4: Limits for organic contaminants in treated and natural potable water

Sl. No.	Substance (Arrange alphabetical order)	Limit µg/L max.	Method of test
i)	Aromatics		
	Benzene	10	ISO 11423
	Toluene	700	-
	Xylene	500	-
	Polynuclear aromatic hydrocarbon	0.7	ISO 13877
ii)	Chlorinated Alkanes and Alkenes		
	Carbon tetrachloride	2	-
	1,2-Dichloroethane	30	-

	1,1-Dichloroethylene	0.3	-
	1,1-Dichloroethene	30	-
	Tetrachloroethene	40	-
iii)	Phenolic substances		
	Phenols	2	ISO 8165
	2,4,6-Trichlorophenol	200	ISO 14402
iv)	Trihalomethanes		
	Chloroform	30	-
v)	Pesticides		
	Aldrin/Dieldrin	0.03	"ISO 15089
	Chlordane (total)	0.3	
	2,4- Dichlorophenoxyacetic acid	30	
	DDT (total)	1	
	Heptachlor and Heptachlor Epoxide	0.03	
	Hexachlorobenzene	1	
	Lindane BHC	2	
	Methoxychlor	20	
vi)	Surfactants (reacting with methylene Blue)	200	ISO 16265
vii)	Mineral oil	0.01	-
viii)	Organic matter	3	-

e)Microbiological contaminants

Potable water shall conform to the microbial limits affecting safety as indicated in Table 3.2.5.

Table 3.2.5: Microbiological limits for potable water

Sl. No.	Type of micro-organism	Potable water	Method of test
i)	Total viable counts at 22 °C, in mL, max. a)	100	ISO 6222
	Total viable counts at 37 °C, in mL, max. a)	50	
ii)	Total Coliforms b) in 100 mL	Absent	ISO 4832
iii)	*E. coli* b) in 100 mL	Absent	ISO 9308-1
iv)	*Staphylococcus aureus* in 100 mL	Absent	ISO 6888-1
v)	Sulphite reducing anaerobes in 100 mL	Absent	ISO 6461-2

vi)	*Pseudomonas aeruginosa* fluorescence in 100 mL	Absent	ISO 16266
vii)	*Streptococcus faecalis* in 100mL	Absent	ISO 7899-2
viii)	*Shigella* in 100 mL	Absent	ISO 21567
ix)	*Salmonella* in 100 mL	Absent	ISO 6785

a) This parameter is for monitoring the system at source. Total time before analysis should be not more than 6 h at 4 ºC. Determination of total viable counts shall start within 12 h after collection of the potable water sample.

b) During the bacteriological quality control for different types of water

A summary of bacteriological quality requirements for different types of water supplies is given in Table 3.2.5.1 below.

Table 3.2.5.1: Bacteriological quality requirements for different types of water supplies

Type of supply	Number per 100 ml		Methods of test
Treated water entering the distribution system	E. coli	Absent	ISO 4832
	Coliform organisms	Absent	
Untreated water entering the distribution system	E. coli	Absent	
		3 coliform organisms in any one sample	
		Absent in any two consecutive samples	
		Absent in 98 % of yearly samples	
Water in distribution system	E. coli	Absent	
		3 coliform organisms in any one sample	
		Absent in any two consecutive samples	
		Absent in 95 % of yearly samples	
Unpiped supplies	E. coli Coliform organisms	Absent	
		10	
Emergency supplies of water	E. coli Coliform organisms	Absent	
		Absent	

f)Radioactive characteristics

Potable water shall conform to the limits for radioactive materials stipulated in Table 3.2.6.

Table 3.2.6: Limits for radioactive materials in treated and natural potable water

Sl. No.	Radioactive material	Limits in Bq/L	Method of test
i)	Gross alpha activity	0.5	ISO 9696

ii)	Gross beta activity	1	ISO 9697

.1.8 Rwanda Utility Regulatory Authority (RURA)

Rwanda Utilities Regulatory Authority (RURA) was initially created by the Law n° 39/2001 of 13 September 2001 with the mission to regulate certain public Utilities, namely: telecommunications network and/or Telecommunications services, electricity, water, removal of waste products from residential or business premises, extraction and distribution of gas and transport of goods and persons.

Role: RURA is responsible setting the prices and rates to be charged for the water supply and sanitation services which will be relied upon in the course of the study to assess financial viability of the project. In addition, during operation of the project water tariff to be applied is the one set by RURA

3.1.9 Local Government

Generally, decentralized entities are responsible for the implementation of laws, policies, strategies, objectives and programmes relating to protection, conservation and promotion of the environment in Rwanda. Article 61 of environmental law state that in the framework of conservation and protection of the environment, decentralized entities are particularly responsible for:

- ensuring activities related to better management of land, especially controlling soil erosion and tap rain water;
- Afforestation, protection and proper management of forests;
- efficient management of rivers, lakes, sources of water and underground water;
- efficient management and effective use of swamps;
- Protection and proper management of reserved areas, historical sites, endangered animal and plant species.

Under the General Guidelines and Procedure for ESIA Local Governments of all Districts and their respective sectors and cells are tasked to perform the following functions:

- At the request of RDB, review Project Briefs so as to advise on Terms of Reference,
- Provide information or advice to developers and ESIA Experts when consulted during ESIA process,
- At the request of RDB, review ESIA reports and provide comments to RDB,
- Assist RDB in organizing public hearings,

- Host public hearings,
- Host individual consultations,
- Gather written comments from public and transmit them to RDB.
- Facilitate the land acquisition process through land bureau office;
- Plan and complaints resolutions.

3.1.10 Ministry of Finance and Economic planning

The Vision of the Ministry of Finance and Economic planning is developing Rwanda into a country free of poverty. Its Mission Statement is to raise sustainable growth, economic opportunities, and living standards of all Rwandans.

Role: The ministry of finance will mobilise the financial resources responsible for funding the outcome of this study in order to realise the objectives of the study, liaison with the financier and if required to provide the constribution required by the Government of Rwanda in this project.

3.1.12Ministry of Health (MINISANTE)

The mission of the Ministry of Health is to provide and continually improve affordable primitive, preventive, curative and rehabilitative health care services of the highest quality, thereby contributing to the reduction of poverty and enhancing the general well-being of the population.

In a bid to achieve its mission is to ensure universal accessibility (geographical and financial) of equitable and affordable quality health services (preventative, curative, rehabilitative and promotional services) for all Rwandans.

Role: The Ministry of Health has the lead in household sanitation and hygiene promotion for which this study will be valuable. This study will ensure that 100% access clean water supply and sanitation systems are developed and will promote hygiene and sanitation.

3.1.13 Rwanda Energy Group

The Vision of Rwanda Energy Group (REG) is to be the leading regional provider of innovative and sustainable energy solutions for national development. With the Mission of Developing and providing reliable and affordable energy while creating value for our stakeholders.

Role: REG will provide electrical energy for use by the water treatment plant developed by the study. During Studies REG is consulted about sufficiency of power to run

electromechanical equipments and WTP systems, advise on other best alternatives of power supply and engaged in electricity related works.

3.2 POLICY FRAMEWORK

The National Policies, Plan and Strategies relevant to water supply projects are summarized in the table below showing the national policies and their relevancy to the Water supply project:

Table: 3.1 Showing the National Policies

Policy, Plan, Strategy	Objective	Relevance
Rwanda Vision 2050	The main objective of Vision 2050 to ensure high standards of living for all Rwandans. In five main areas of: Quality of Life, Modern Infrastructure and livelihoods, Transformation for prosperity, Values for Vision 2050 and International cooperation and positioning.	The implementation of the project will contribute in achieving the main objective of Vision 2050 by providing water and job opportunities for quality of life, modern infrastructure and transformation for prosperity in the project areas.
National Strategy for Transformation (NST 1) 2017 - 2024	NST 1 is the implementation instrument for the remainder of Vision 2020 and for the first four years of Vision 2050 to provide the foundation and vehicle towards Vision 2050 through specifically economic and social transformation.	The project implementation will contribute to achieve NST1 objectives by providing water and employment opportunities hence contributing to economic and social transformation.
Rwanda Vision 2020, revised 2012	To build a nation in which pressure on natural resources, particularly on land, water, biomass and biodiversity, has significantly been reduced and the process of environmental pollution and degradation has been reversed.	During implementation of project the contractor and local communities will be sensitized to efficiently manage natural resources such as water and environment as stipulated in the Rwanda Vision 2020.
National Environment and Climate Change Policy, 2019.	The main objective of the National Environment and Climate Change Policy is to make Rwanda a nation that has a clean and healthy environment, resilient to climate	The water supply project will comply with this policy by ensuring health and safety standard on environment and climate change; only approved quarries and borrow pits will be used and ensure

Policy, Plan, Strategy	Objective	Relevance
	variability and change that supports a high quality of life for its society.	restoration plan are implemented at the end of the project implementation.
National Land Policy, 2004	The overall objective of the national land policy is to establish a land tenure system that guarantees tenure security for all Rwandans and give guidance to the necessary land reforms with a view to good management and rational use of national land resources.	Basing on this land policy, the project will respect mechanisms which guarantee land tenure security. Where not possible, fair compensation will be provided.
National Health Policy, 2016	One of the objectives of Rwanda Heath Sector Policy is to improve the quality of life and demand for services in the control of disease. The policy identifies the most common illnesses as a result of unhealthy living or working environment.	The project will comply with this policy by ensuring health safety and the good working conditions and implement awareness programme on HIV Aids, STD, Malaria and Ebola to workers.
National sanitation policy, 2016	The policy provides for decentralization in line with the national decentralization policy, institutional aspects, integrated watershed management, monitoring and assessment and participatory approach to water and sanitation among other sectoral reforms in Rwanda	The water supply project is in line with this sanitation policy through integrated water supply management, monitoring and assessment and participatory approach to water and sanitation among other sectoral reforms in Rwanda
National Policy for water resources management, 2011	The water policy aims at fair and sustainable access to water, improvement of the management of water resources, etc. through reforestation , water catchments areas and water collection	The water supply project will comply with this policy improving and upgrading water networks for fir and sustainable access to potable water.
National Biodiversity	This strategy defines the objectives and priorities for the conservation and sustainable	The project falls under the objectives of this policy for the conservation and sustainable management of biodiversity

Policy, Plan, Strategy	Objective	Relevance
Strategy and Action Plan, 2016	management of biodiversity. The plan includes hillsides and wetlands and protected areas as some of the areas that need to be conserved.	by avoiding the use of wetlands and other protected areas.
Urbanization and Rural Settlement Sector Strategy 2013-2018	The Urbanization and Rural Settlement Sector encompasses social, economic and environmental activities. It has relevance to both, urban and rural areas. According to policies of Rwanda, access to a decent housing and favourable living conditions is a fundamental right for all citizens.	The project is in line with the action plan as the management of ongoing urbanization requires the establishment of infrastructures for development planning, zoning and urban renewal, with the provision of adequate infrastructure facilities such as water supply networks.
Rwanda Biodiversity Policy, 2011	The goal of this Policy is therefore: To conserve Rwanda's biological diversity, to sustain the integrity, health and productivity of its ecosystems and ecological processes, whilst providing lasting development benefits to the nation through the ecologically sustainable, socially equitable, and economically efficient use of biological resources.	The project will comply with this policy by avoiding destruction of natural and resources through avoidance of unnecessary vegetation clearance (habitat destruction).
National Urbanization Policy, 2015	One of its objective is: Improvement of the living conditions of the population in existing precarious neighbourhoods, and restructuration and equipment of those neighbourhood's with basic infrastructure, and secure land tenure status.	The project will improve the living conditions of the population by providing basic water infrastructure.
National Occupational Safety and Health Strategy, 2019	It aims at providing a framework for coordination of Occupational Health and Safety (OSH) activities among public, private, employees	This policy will govern the project implementation by establishing safety and health standards at workplace and

Policy, Plan, Strategy	Objective	Relevance
	organizations and civil society institutions	ensure compliance with occupational safety and health standards.
Environmental Health Policy, 2008	The overall objective of the Environmental Health Policy is provision of adequate environmental health services to all Rwandans with their active participation.	The project will comply with this policy by providing good environmental, social, health and safe working conditions to workers and neighbouring residents.
National Strategy for Climate Change and Low Carbon Development, 2011	This Strategy is the first attempt at plotting a climate resilient and low carbon development pathway `for Rwanda. It is the start of a continuous process which is described in the Enabling Pillars and it will be implemented through the Programmes of Action	This project will contribute to the achievement of the goals by achieving socio-economic development (water supply) that is resilient to economic, social and environmental shocks related to population growth and climate change.

3.3 LEGAL FRAMEWORK

A summary of the national legal framework applicable to water supply water project is presented in the table below:

Table: 3.2. National legal framework

Law/Regulation/Order	Objective	Relevance
The Constitution of the Republic of Rwanda, 2003 as revised in 2015	The Constitution is clear on the right to property that it will not be encroached upon except in public interest and in accordance with the provisions of the law. The constitution specifies that everyone has the right to live in a clean and healthy environment and everyone has the duty to protect, safeguard and promote the environment.	The water supply project will comply with the Constitution by implementation of applicable laws (Laws on Expropriation, labour, and Environment) and will ensure socio-economic development and comply with environmental laws.
Law on Environment, 2018	This Law determines modalities for protecting, conserving and promoting the environment.	Given the nature of this project and based on this law, the project activities are classified under this project that

Law/Regulation/Order	Objective	Relevance
		must undergo an Environmental Impact Assessment before obtaining authorization for its implementation. This reviewed and updated report serves as proof of compliance to the requirements of this law.
Law N°49/2018 of 13/08/2018 determining the use and management of water resources in Rwanda	This Law determines the use management of water resourc Rwanda. This law governs both n and artificial water and their boun and provides guiding principles.	This project will comply with this law by the protection and rational use of water resources which constitute the obligations of each and every person and project. In addition as stipulated in the law, the contractor will avoid dumping, spilling or depositing anything that may pollute water resources.
National Land Law, 2013	This Law determines modalities of allocating, acquisition, transfer, use and management of land in Rwanda. It also establishes the principles applicable to rights recognized over all lands situated on Rwanda's national territory and all rights united or incorporated with land, whether naturally or artificially.	Since the project will affect lands hence compensation, based on this law is relevant to the project. Land in Rwanda is allocated or leased to individual evidenced by a certificate of land registration. The project will ensure rights on lands are considered and observed.
Law N° 13/2014 of 20/05/2014 on Mining and Quarry Operations	This Law determines mining and quarry exploitation in Rwanda and caters for activities relating to quarry licence application, transfer of quarry licences, rights and responsibilities of the holder of a quarry licence, relinquishment of a quarry licence area and Cancellation of a quarry licence.	Quarries and borrow pits will be required to construct reservoirs and water kiosks and its other components. This law will be enforced during project implementation by ensuring quarries are approved by the District and restoration plans are provided and implemented at the end of the project.
Law relating to expropriation in the public interests, 2015	This Law determines procedures relating to expropriation in the public interest.	Since the project is in the public interest, this law will be applied during expropriation and compensation exercise of the people affected by the project where applicable.

Law/Regulation/Order	Objective	Relevance
Law Regulating Labour in Rwanda, 2009	This law applies employment relations based on employment contract, apprentices, interns, self-employed person, informal sector, occupational health and safety and the right to form trade unions and employers' associations.	The project will abide by good conducive working conditions during the implementation of the project. Labour law will be used to ensure good working conditions and wellness. All forms of discrimination will be avoided during recruitment of workers.
Law governing the preservation of air quality and prevention of air pollution in Rwanda, 2016	This Law determines modalities for preservation of air quality and prevention of air pollution in Rwanda.	As per this law, the project will implement measures aimed at the preservation of air quality as well as all elements or activities likely to affect air quality or pollute the atmosphere in the project areas by watering access road and excavated areas in dry season and ensure the use of equipment with low gas emissions.
Law governing biodiversity in Rwanda, 2013	This Law determines modalities for management and conservation of biological diversity within Rwanda.	The management and conservation of biological diversity in the project areas will be considered during the project implementation where necessary by implementing the ESMP and monitoring plan of this report.
Ministerial Order determining the list of prohibited plains to constructions, 2005	This Order determines the list of plains on which construction is prohibited and stipulated that whenever appropriate studies establish the need for other plains not on this list to be protected from construction, the Minister in charge of Environment may order that construction to be prohibited on those plains.	The project will comply with this ministerial order by not approving any construction on the areas provided on the list of prohibited plains to construction. The ESIA scoping did not find any plain in proposed areas.
Ministerial order No 007/2008 of 15/08/2008 establishing the list of	The Ministerial order provides a lists of protected animal and plant species and their classifications as mammals, birds, reptiles for animals and corresponding scientific names for both the protected animals and plants	The project will comply by this ministerial order by ensuring not to disturb or kill protected animals and plants and will assess the existence or not of these species in the project areas.

Law/Regulation/Order	Objective	Relevance
protected animal and plant species		
Ministerial Order establishing the list of projects that must undergo environmental impact assessment, instructions, requirements and procedures to conduct environmental impact assessment, 2019.	The order specifies the works, activities and projects that have to undertake an environmental impact assessment. The list of works, activities and projects that must undergo a full environmental impact assessment before being granted authorization for their implementation	Basing on this ministerial order the project activities are classified under project that must undergo an Environmental Impact Assessment before obtaining authorization for its implementation. This report serves to comply with this ministerial order.
Ministerial order relating to the requirements and procedure for environmental impact Assessment (EIA), 2018	The order defines the Environmental Impact study as a systematic way of identifying environmental, social and economic impacts of a project before a decision of its acceptance is made. The order specifies the application and review procedure and schedule.	In this report, the project has considered identifying environmental, social and economic impacts of all activities before taking decision to comply with this ministerial order.
Ministerial Order determining modalities of establishing and functioning of occupational health and safety committees, 2012	This Order determines modalities of establishing and functioning of occupational health and safety committees.	As a good practice, health and safety will be given a priority by ensuring regular toolbox meetings on health and safety during construction. Health and safety committees will be established and governed by this ministerial order during project implementation.
Ministerial Order determining conditions for occupational	This Order determine the general and specific rules and regulations relating to health and safety at workplace in order to secure the	As a good practice, health and safety will be given a priority by ensure regular toolbox meetings on health and safety during construction. Health and safety

Law/Regulation/Order	Objective	Relevance
health and safety, 2012	safety, health and welfare of persons at work and protect them against risks to safety and health arising from work	committees will be established and governed by this ministerial order during project implementation.
Rwanda building control regulation, 2012	The Building Control Regulations is a nationally recognized document, which will serve as a standard reference for the regulation of building design and construction.	The project is classified as a building project hence will be in compliance with the Rwanda building control regulation
Sector guidelines for EIA for water supply development projects in Rwanda, 2009	These guidelines help in ensuring that the lessons learned from these experiences are integrated into future best practice in relation to EIA for water supply projects.	This ESIA has considered these sector guidelines as compliance during project implementation.

3.3 REGIONAL POLICIES AND REGULATIONS

3.3.1 EAC protocol on environment and natural resources

This Protocol shall apply to the East Africa Partner States' co-operation in the management of the environmental and natural resources within their jurisdiction including trans- boundary ecosystems and natural resources.

Article 3 of this Protocol states that it is a protocol of general application and shall apply to all activities, matters and areas of management of the environment and natural resources of the Partner States, including the following: (i) sustainable environment and natural resources management; (ii) management of trans-boundary resources; (iii) conservation of biological diversity; (iv) management of forest and tree resources; (v) management of wildlife resources; (vi) management of water resources; (vii) management of wetland resources; (viii) management of coastal and marine resources; (ix) management of fisheries resources; (x) management and access to genetic resources; (xi) management of mineral resources; (xii) management of energy resources; (xiii) management of mountain ecosystems; (xiv) soil and land use management; (xv) management of rangelands; (xvi) combating desertification and mitigating the effects of drought; (xvii) protection of the ozone layer; (xviii) tourism development; (xix)biosafety and biotechnology; (xx) management of chemicals; (xxi) management of wastes and hazardous wastes; (xxii) pollution control and management; (xxiii)environmental impact assessment and environmental audits; (xxiv) environmental standards; (xxv) military and hostile activities; (xxvi) environmental education and capacity building; (xxvii) public participation, access to information and justice; and (xxviii) environmental disaster preparedness and management.

3.4 INTERNATIONAL POLICIES AND REGULATIONS

3.4.1 AfDB Integrated Safeguards System (ISS)

Approved in 2013, the AfDB ISS is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. The safeguards aim to:

- Avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible;
- Minimized, mitigate, and/ or compensate for adverse impacts on the environment and affected people when avoidance is not possible; and help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks

The 'Environmental and Social Safeguard Policies' of the African Development Bank (AfDB) consist of Environment Policy, Operations Manual and Guidelines; Policy on Involuntary Resettlement. The preparation of the environmental and social impact assessment for the proposed project has also followed the AfDB Environmental and Social Assessment Procedure (ESAP).

The ESAP gives the steps to be undertaken when undertaking an ESIA including the generic terms of reference of an ESIA; typical contents of an ESIA and the minimum contents of an Environmental and

Social Management Plan (ESMP). It defines ESIA as an Instrument whose purpose is to identify and assess the potential environmental and social impacts of a proposed project, evaluate alternatives, and design appropriate mitigation/enhancement, monitoring, consultative and institutional strengthening measures. The ESAP divides projects into four categories:

- **Category 1**: projects are those that are likely to have significant and irreversible environmental and social impacts, widespread in extent and require a full ESIA.
- **Category 2:** projects are likely to have detrimental and site-specific environmental and social impacts that can be minimized by the application of mitigation measures included in an ESMP.
- **Category 3:** shall not induce any adverse environmental and social impacts and do not need further action.
- **Category 4:** projects involve investment of Bank's funds through Financial Intermediaries (FIs) in subprojects that may result in adverse environmental or social impacts. Specific requirements for this type of project include an assessment of FI capacities to handle environmental and social considerations.

The proposed project for the Rehabilitation of NZOVE 1 Water Treatment Plant and Water Distribution Network in Kigali falls under a category 2 within the AfDB's ISS because the potential environmental and social impacts are not significant, localized in nature and can be managed via a robust ESMP which is an integral part of this ESIA. The AfDB Operational Safeguards under the Integrated Safeguards System are detailed below:

Operational Safeguard 1: Environmental and Social Assessment

This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements: the scope of application; categorization; use of the appropriate Environmental and Social Assessment ESA (SESA, ESIA, ESMF, ESMP); climate change vulnerability assessment; public consultation; community impacts; appraisal and treatment of vulnerable groups; and grievance procedures. It updates and consolidates the policy commitments set out in the Bank's policy on the environment.

At project level, clients are responsible for conducting the ESA and for developing, as an integral part of project documentation, an appropriate plan for managing possible impacts. The Bank's environmental and social staff in operations, support the due diligence process and ensure that borrowers and clients are fully aware of Bank policies and procedures, while the Bank's Compliance and Safeguards function ensures that deliverables and the compliance process are properly conducted to ensure good quality.

To the extent possible, the assessment complies with the relevant legislation and standards applicable in the local jurisdiction, bearing in mind the equivalence of standards with those of the Bank, and it takes into consideration national- or regional- level programming documents (i.e., CSP or RISP) that are under implementation or in preparation.

Operation Safeguard 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation

This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement, and it incorporates refinements designed to improve the operational effectiveness of those requirements. In particular, it embraces comprehensive and forward-looking notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasizes the need to maintain social cohesion, community structures, and the social interlinkage that common property provides.

The specific objectives of this OS is to avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored;

The safeguard retains the requirement to provide compensation at full replacement cost; reiterates the importance of a resettlement that improves standards of living, income- earning capacity, and overall means of livelihood; and emphasizes the need to ensure that social considerations, such as gender, age, and stakes in the project outcome, do not disenfranchise particular project-affected people.

The affected populations are offered a range of different compensation package, resettlement assistance, and livelihood improvement options, as well as options for administering these measures at different levels (e.g., family, household and individual), and the affected persons themselves are given the opportunity to express their preferences. This option-based resettlement planning is part of a development approach that aims to ensure that the affected populations are able to reconstruct their production foundations and become self-sustaining producers and wage earners.

Particular attention is given to ensuring that the interests of both women and men and of the elderly and the handicapped are taken into account when formulating and implementing compensation packages, resettlement assistance measures and livelihood improvement measures. As a concrete step to implementing this requirement, households headed by women especially widows are provided productive land to improve their income and livelihood sustenance capacity in rural areas where livelihoods are generally agriculture-based. In general, compensation arrangements, resettlement assistance and livelihood improvement measures, such as skills training, are made equally available to all social groups and adapted to their specific needs, even when land is owned.

Operational Safeguard 3: Biodiversity, Renewable Resources and Ecosystem Services

This Operational Safeguard (OS) outlines the requirements for borrowers or clients to (i) identify and implement opportunities to conserve and sustainably use biodiversity 1 and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services.

The specific objectives of the OS are to: Conserve biological diversity and ecosystem integrity by avoiding or, if avoidance is not possible, reducing and minimizing potentially harmful impacts on biodiversity; Endeavour to reinstate or restore biodiversity, including, where some impacts are unavoidable, through implementing biodiversity offsets to achieve "not net loss but net gain" of

biodiversity; Protect natural, modified, and critical habitats; and Sustain the availability and productivity of priority ecosystem services to maintain benefits to the affected communities and sustain project performance.

As part of the environmental and social assessment:

- The borrower or client identifies and assesses the potential opportunities for, risks to, and impacts on biological diversity and ecosystem services, including direct, indirect, cumulative and pre-mitigation impacts.
- The borrower or client applies the mitigation hierarchy: to avoid potentially adverse impacts; if avoidance is not possible, to reduce and minimize potential adverse impacts; if reduction or minimization is not sufficient, to mitigate and/or restore; and as a last resort to compensate for and offset.
- Special attention is given to the major threats to biodiversity and ecosystem services, such as pollution and contamination, land conversion, habitat fragmentation, natural habitat loss, deforestation, over-exploitation of natural areas and resources, invasive alien species, migration barriers, the capturing of wild animals, the harvesting of endemic species and indigenous ornamental flora and fauna, and wildlife poaching.
- The borrower or client obtains the advice of and uses recognized experts to assess biodiversity and ecosystem services values—for example, cultural, aesthetic, spiritual, educational, and recreational values—identified by potentially affected community members and other stakeholders.

Operational Safeguard 4: Pollution Prevention and Control, Hazardous Materials and Resource Efficiency

This operational safeguard outlines the main pollution prevention and control requirements for borrowers or clients to achieve high-quality environmental performance, and efficient and sustainable use of natural resources, over the life of a project.

The borrower or client applies pollution prevention and control measures consistent with national legislation and standards, applicable international conventions, and internationally recognized standards and good practice. When national legislation and regulations differ from the standards and measures presented in the EHS Guidelines, borrowers or clients are normally required to achieve whichever is more stringent. However, if less stringent levels or measures are appropriate to specific project circumstances, the borrower or client provides full and detailed justification for any proposed alternatives through the environmental and social assessment process. This justification demonstrates that the choice of any alternate performance levels is consistent with the overall requirements of this OS and internationally agreed best available techniques and best environmental practice.

Throughout the different phases of the project's lifecycle—planning and design, construction, commissioning, operations and decommissioning—the borrower assesses and evaluates resource-efficiency and pollution-prevention techniques and implements them, taking into consideration their technical and financial feasibility and cost-effectiveness.

Operational Safeguard 5: Labor Conditions, Health and Safety

According to the Bank principles, Labour is one of a country's most important assets in the pursuit of poverty reduction and economic growth. The respect of workers' rights is one of the keystones for developing a strong and productive workforce. This operational safeguard outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs. This safeguard further establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It covers working conditions, workers' organizations, occupational health and safety, and avoidance of child or forced labor.

The AfDB has 5 Environmental and Social Operational Safeguards and shall be triggered by the Rehabilitation of NZOVE 1 Water Treatment Plant and Water Distribution Network in Kigali as shown in the table below:

Table: 3.2. Summary of AfDB Operational Policies

Operational Safeguard (OS)	Yes	No	Objective / Requirement	Relevance
OS 1: Environmental and Social Assessment	[X]	[ ]	The main objective of OS 1 is to mainstream environmental and social consideration including those related to climate change vulnerability. It requires that project proponent is responsible for conducting environmental and social assessment as an appropriate plan for managing possible impacts	The Project triggers Operational Safeguard 1 because the Water Supply Project falls under category 2, hence requires an Environmental and Social Assessment.
OS2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation.	[X]	[ ]	This OS2 relates to Bank-financed project that cause the involuntary resettlement of people. It seeks to ensure that when people must be displaced they are treated fairly, equitably, and in a socially and culturally sensitive manner; that they receive compensation and resettlement assistance so that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved; and that they share	The Project triggers this Operation Safeguard since it shall affect some properties including land, crops and trees and a compensation process is required basing on bank policies and national laws related to compensation and expropriation where applicable.

Operational Safeguard (OS)	Yes	No	Objective / Requirement	Relevance
			in the benefits of the project that involves their resettlement.	
OS 3: Biodiversity, Renewable Resources and Ecosystem Services.	[X]	[ ]	OS 3 requires to identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The assessment identifies and assesses the potential opportunities for, risks to, and impacts on biological diversity and ecosystem services, including direct, indirect, cumulative and pre-mitigation impacts.	The Water Supply project triggers this OS3 since the project must ensure during implementation and operation to conserve and sustainably conserve the biodiversity and natural habitats in the project areas. This ESIA has identified and assessed the potential impacts on biological biodiversity and ecosystem services and mitigation measures proposed.
OS 4:Pollution Prevention and Control, Hazardous Materials and Resources Efficiency	[X]	[ ]	This OS outlines the main pollution prevention and control requirements for borrowers or clients to achieve high-quality environmental performance, and efficient and sustainable use of natural resources, over the life of a project. It aims at providing ways to Manage and reduce pollutants resulting from the project including hazardous and non-hazardous waste so that they do not pose harmful risks to human health and the environment.	The OS 4 will be triggered by the Water supply Project since some waste shall be generated. However, the ESMP has provided mitigation measures for non-hazardous materials and waste management. According to project activities they will be non-hazardous materials to be used.
OS 5: Labour Conditions, Health and Safety	[X]	[ ]	This OS 5 highlights that the respect of workers' rights is one of the keystones for developing	This OS 5 is triggered by the project. A number of workers shall be recruited locally or

Operational Safeguard (OS)	Yes	No	Objective / Requirement	Relevance
			a strong and productive workforce for any project. This OS 5 outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs, promote compliance with national legal requirements, protect the workforce from inequality, social exclusion, child labour, and forced labour and establish requirements to provide safe and healthy working conditions.	outside the projects areas and these potential social and health impacts may occur. This ESIA provides mitigation measures related to abuse of workers' rights, social exclusion, gender based violence, child abuse and forced labour throughout out project implementation and operation.

3.4.2 Other AfDB Policies

AfDB has developed and enforcing other policies related to many projects including similar project of water Supply as summarized below:

3.4.2.1 Gender policy

The Gender Policy aims to promote gender equity and gender mainstreaming in all AfDB operations. It requires the AFDB to apply gender analysis to all its activities.

3.4.2.2 Gender Strategy

The goal of this strategy is twofold; first, it seeks to strengthen gender mainstreaming in all Bank national and regional operations and strategies. The Bank aspires to be a more caring and more gender-sensitive institution, which also values its female and male staff, protects against discrimination and all forms of harassment and violence, and ensures a safe and secure working environment. Preferential to attract the best professionals.

3.4.2.3 Policy on Poverty Reduction

This policy reaffirms the AfDB's commitment to the overarching goal of poverty reduction through measures to promote national ownership, participation and the obligation of results in its actions to improve living conditions poor people in Africa.

3.4.2.4 Policy on Dissemination and Access to Information

This policy aims to (i) maximize the dissemination of information held by the Bank Group and limit the list of exceptions; ii) facilitate access to information on AfDB operations and its sharing with a broad

spectrum of stakeholders; (iii) promote good governance, transparency and accountability; (iv) improve the effectiveness of implementation and better coordinate information dissemination processes; (v) raise awareness of the Bank Group's mission, strategies and overall activities; (vi) support the consultative process; and (vii) strengthen harmonization with other development finance institutions in the field of information dissemination.

The objectives of this policy are also to encourage States to communicate information to the public, in particular to groups directly affected by operations in the Member States; increase public awareness of Bank Group operations, activities, policies, programs, procedures and operations, facilitate the participation of local populations affected by Bank Group-financed projects including non-Bank organizations; eligible governments ("NGOs") recognized by the Bank Group and other relevant community organizations.

3.4.3 International conventions

3.4.3.1 Ramsar Convention

In 1971, the international Convention on Wetlands was adopted in Ramsar, Iran. The Ramsar Convention is an inter-governmental treaty for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention has been signed by 159 governments (contracting parties) of which Rwanda is part.

The Ramsar List of Wetlands of International Importance includes over 1,800 wetland sites, covering all regions of the planet. Ramsar makes grants in support of its objectives:

- Conservation and wise use of wetlands;
- Emergency conservation assistance at Ramsar sites.

3.4.3.2 United Nations Framework Convention on Climate Change (UNFCCC)

UNFCCC provides the basis for global action "to protect the climate system for present and future generations". The Convention has been universally signed by 189 countries. Rwanda is a signatory to this convention.

The main objective of this Convention is to achieve stable greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

The Convention requires a framework for inter-government efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases.

At the UNFCC Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices.
- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries.

- Cooperate in preparing for adaptation to the impacts of climate change.

3.4.3 Other International legal framework applicable to the project and ratified by Rwanda

The following conventions and regulations have been signed and ratified by Rwanda and are to be taken into consideration through the overall project cycle because they have been signed /ratified by Rwanda.

- The international Convention on Biological diversity and its habitat signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 017/01 of 18 March 1995;
- The CARTAGENA protocol on biodiversity to the Convention on Biological biodiversity signed in NAIROBI from May 15, to 26, 2000 and in NEW YORK from June 5, 2000 to June 4, 2001 as authorized to be ratified by Law No 38/2003 of 29 December 2003;
- The United Nations Framework Convention on Climate Change, signed in RIO DE JANEIRO in BRASIL on 5 June 1992, as approved by Presidential Order No 021/01 of 30 May 1995;
- The KYOTO Protocol to the framework on climate change adopted at KYOTO on March 6, 1998 as authorized to be ratified by Law No 36/2003 of December 2003;
- The RAMSAR International Convention of February 2, 1971 on Wetlands of International importance, especially as water flows habitats as authorized to be ratified by Law No 37/2003 of 29 December 2003;
- The STOCKHOLM Convention on persistent organic pollutants, signed in STOCKHOLM on 22 May 2001, as approved by Presidential Order No 78/01 of 8 July 2002;
- The ROTTERDAM International Convention on the establishment of the international procedures agreed by states on commercial transactions of agricultural pesticides and other poisonous products, signed in ROTTERDAM on 11 September 1998 and in New York from 12 November 1998 to 10 September 1999 as approved by Presidential Order No 28/01 of August 2003 approving the membership of Rwanda;
- The BASEL Convention on the Control of Tran boundary Movements of Hazardous wastes and their disposal as adopted at BASEL on 22 March 1989, and approved by Presidential Order No 29/01 of 24 August 2003 approving the membership of Rwanda;
- The MONTREAL International Conventional on Substances that deplete the Ozone layer, signed in LONDON (1990), COPENHAGEN (1992), Montreal (1997), BEIJING (1999), especially in its article 2 of LONDON amendments and Article 3 of COPENHAGEN, MONTREAL and BEIJING amendments as approved by Presidential Order no 30/01 of 24 August 2003 related to the membership of Rwanda;
- The BONN Convention opened for signature on June 23, 1979 on conservation of migratory species of wild animals as authorized to be ratified by Law No 35/2003 of 29 December 2003.

This shows the commitment of Rwanda to fulfil all the requirements at international level in terms of environmental protection toward sustainable development.

CHAPTER 4 : BASELINE CONDITIONS AND DATA

4.1 PHYSICAL ENVIRONMENT

Physical environmental survey involves understanding the actual status of the area, in regard to; Climate (temperature, rainfall), topography, hydrography, land use, soil and geology. Physical parameters of the project areas are discussed hereafter.

4.1.1 Climate

The project area has a typical tropical climate, which is characterized by high annual rainfall of up to 1400 mm per annum. The area experiences a bimodal rainfall occurring mostly during the period from March to May and September to November. High intensity thunderstorms/showers that are generally short lived and cause often flooding in the Nyabugogo wetlands. During the rainy months from March to May and during September and November rainfall may reach 300mm / month. During the dry months from Mid- January to March and from June to August it is about 50mm per month.

The study area experiences seasonal temperature variations with highest temperatures during the dry season and the coldest period occurs during the rainy season. The average monthly maximum temperature ranges between 22-27^{o}C while the average minimum temperature ranges between 17-20^{o}C.

4.1.2 Hydrography

The hydrology of the project area ids dominated by Nyabarongo river and is very limited in terms of rivers and streams. The Nzove area mainly benefit from Nyabarongo river which flows through the entire project area and surroundings.

4.1.3 Topography

The topographic setup around the project area of Nzove is characterized by mountains, hills and wetlands. Mount Kigali in the south west of the project are has the highest elevation in the area, with its top at 1858 m above mean sea level. Nzove water treatment plant is located at 1371 meters above mean sea level.

4.1.4 Geology and Soils

The project area is dominated by quartzite and quartzite conglomerate rocks. The geology in and around Nzove area is dominated by granitic rocks with schists predominance, silt stones and sand stones. The project area is also characterized by erosion due to heavy rains and over flooding of Nyabarongo river during rainy season. The drainage area of Nyabarongo river is mostly predominated by alluvial and organic soils.

4.1.5 Land use and Settlement

The land use in the project areas is mixed. It varies from urbanised area to semi urbanised area and from residential to industrial zone. The urbanised area is not dense and characterised by residential, commercial houses and public services building such as schools, market and health facilities. Within Nzove water treatment plant and its surroundings sugar canes plantation dominate

the agricultural activities with scattered seasonal crops plantations. The industrial zone of the project area is dominated by the existing Nzove water treatment plant and Skol Breweries factory.

Figure: The raw water collection system for Nzove I is located in marshland dominated with sugar canes and penissetum while the plant itself in mixed building area.

4.2. BIOLOGICAL ENVIRONMENT

4.2.1 Flora and Fauna

The project area is dominated by sugar cane plantation and scattered seasonal crops. The banks of Nyabarongo river are protected by huge bamboo plantation. In addition, the local population planted pennisetum grass in a stretch of about 10 meters from the river for production reasons, processed in various handicraft products.

The Nyabarongo catchment receives a large number of domestic and migratory birds. Typical bird species commonly found the project area are mainly the African Spoonbills, African Openbills, Little Egrets and Sacred Ibises, who rest here in the trees, and depend on the nearby seasonal crops and cash crops such as rice plantations and wetlands for their food.

Figure: One of the borehole top structure(left) and raw water collector chamber with its transformer(right) belonging to the well field for groundwater all located in Nyabarongo plain.

In addition, native fauna includes reptiles, snakes, lizards, hares, jackals and fishes. Nearby the project area a number of domestic animals such goats, sheep and cattle are kept.

4.2.2 Sensitive ecosystems

The sensitive ecosystem in the project area is Nyabarongo river and its banks which are exposed to erosion, flooding, land sides and to human activities. The project activities shall be implemented by applying mitigation measures to preserve Nyabarongo river flow and its shores. An environmental management and monitoring is developed in this report for this purpose.

Figure: Nzove complex surface water intakes on Nyabarongo river surrounded by bamboo, sugar canes and other plantations

4.3. SOCIO-ECONOMIC PROFILE

4.3.1 Household Size

Based on the socio-economic survey, the mean household size of the City of Kigali is 5.4 persons per household. In general, households in urban areas are relatively small. Especially for 1 person households, they can run the household by themselves which may be due to a higher income and better utility services.

4.3.2 Source of Income

In the project area, the main income generating activity is full time employment and off farm and farming which occupies 82.5% of sampled households. Further, results show that in the sectors surrounding the project area, farming is still the main income generating activity, on the other hand, the main income generating activity for households having no access to improved water is also farming.

4.3.3 Sanitation

Though the overall access rate to improved sanitation facilities is relatively high among Rwandan population, the detailed analysis shows that there are still gender inequalities in distribution of improved sanitation among male and female headed households. The proportion of female HH with access to improved sanitation facilities is low compared to that of male HH with 76.6% compared to 85.7% respectively. This may be attributed to unequal income distribution between men and women where women tend to have low income combined with high illiteracy rate.

4.3.4 Housing characteristics

The most common type of habitat in the project areas is the clustered semi urban settlement (known as Umudugudu). Mostly, private households are of that type and the remaining dispersed/isolated housing and spontaneous/squatter housing. The type of habitat varies a lot across the project areas: the clustered semi urban settlement is more prevalent in some areas.

In the project areas, housing units are mainly covered by iron sheets and few are made of local tiles. The walls of the housing units are mostly built with sundried bricks and few are made of wood/mud. The binding material is mostly mud and with others made in cement. The floor is covered with cement pavement with few with tiles. The openings such as doors and windows are mainly made of trees and wood while few are made of metallic openings.

4.3.5 Access to potable water

Access to potable water is still low in the project area but the proposed program will increase the capacity of water supply country wide and extend the number of people with access to clean water. The improvement and expansion of water supply system will enable greater responsiveness to the demand, increasing also the reliability of the operating system. The reliability of the system will allow adequate planning for water supplies.

4.3.6 Distance from nearest water source

This study results show that in the project area, 90.8% of households are living within 200 meters from the nearest source of drinking water compared to 27.3% in the sectors surrounding the project area. In the project area, piped into Dwelling/Piped to Yard/Plot is dominant (75.9%). However, average distance from a household to the nearest drinking water source is 50.23 meters in the project area.

4.3.7 Infrastructure

Like many urban and peri-urban areas the infrastructure is dominated by roads, social infrastructure (churches, schools, health centres, markets, stadium, etc.) and private buildings. The project area accessed from the national rod from Kigali to Musanze and access through a murrum road in good conditions.

4.3.8 Water source

The main source of water in the project area for private households' use is the improved supply from the national water utility WASAC Ltd and public taps and reservoirs. Another source of water for households, the rainwater collected from gutters is also used for various purposes.

4.3.9 Energy source

In the project area, the source of energy is dominated by electricity from the national utility REG Ltd and supplemented by few households which use kerosene lamp, candles and firewood but very recently, solar energy has been introduced as a new source of energy in some households. Most private households use mainly charcoal and firewood as source of energy for cooking, and few with Liquefied Petroleum Gas (LPG).

CHAPTER 5: PROJECT ALTERNATIVES

The alternatives to the project are different ways to achieve the same purpose and need that the proposed project will achieve. The options proposed to this projects falls into three categoties as the works for raw water development, treatment system and clear water transmission are different and each of them complex in itself. Prior to commencement of works and during ESIA scoping and sites visits, consultations have to be held with potential PAPs, neighbouring communities of the project area and local leaders and client personnel. At this stage of the preliminary, only discussions were conducted in the areas identified to be the WTP , landfill and FSTP areas when the consultant was on field for investigations. The detailed stakeholder consultation will be organised and conducted in next stages when precisions on locations and sizes of infrastructures will be confirmed and RAP conducted.

5.1 Ground Water Supply Options (GW)

The four options proposed for groundwater to be the raw water source for Nzove I WTW are:

1. **Option 1:** Rehabilitate all 31 boreholes in order to produce a sustainable yield of 25.5 ML/day.
2. **Option 2:** Rehabilitate as much of the existing system as possible, adopting the same or improved design for new/replacement BH's that will replace units that are no longer functional to meet the required 40 ML/day production.
3. **Option 3:** Design an entirely new groundwater supply system in the vicinity of the Nzove WTW complex that would meet the required 40 ML/day raw water capacity – utilization of some or the entire existing pipeline system is considered in this option.
4. **Option 4:** Design entirely two new groundwater supply systems in the vicinity of Nzove I WTW to supply 80ML/d.

The option 2 was selected as best for implementation as it increase the water production to the initial design capacity of the Nzove I WTP. In addition to this, it is was found to be most economically feasible, socially acceptable and environmentally friendly compared with other proposed options. Option 1 was not adopted as it doesn't solve the problem of reaching the design capacity of the WTP (it can only give 25.5m3/d). Option 3 and 4 require to ignore the existing boreholes and the raw water collection pipeline system and develop new well field and yet there are some that are functional. In addition, in doing so, a highest investment will be required.

5.2 Surface Water Supply Options (SW)

The following options are based on surface water development by upgrading the existing intakes on Nzove II and III and abstract more water and distribute them to the three WTP. This set of options was proposed to intervene in case groundwater is found not reliable in terms of quantity as it is known that with climate change, it may happen in future. These options were not considered for the current implementation as the groundwater source is still working and the related instrastructures have to be useful still. In addition to abandon groundwater and shift to surface water require a radical change and transformation of Nzove I WTP to make it a full conventional treatment system. Therefore, none of these options were not selected for immediate implementation, rather for future.

The four options considered for treatment of combined surface water from the Nyabarongo River and ground water to be the raw water source for Nzove I WTW are:

1. **Option 1**: upgrade, if found necessary, some components of the Large raw water abstraction work to 139.3 ML/day and maintain Small raw water abstraction work as emergency. This will enable to produce 145 ML/day of treated water from Nzove WTW complex (***Nzove I - 40*** *(12.7+27.3) ML/day, Nzove II - 40 ML/day, & Nzove III – 65(40+25) ML/day)*.
2. **Option 2**: upgrade, if found necessary, some components of the Large raw water abstraction work to 139.3 ML/day and Small raw water abstraction work to 42.1 ML/day. This will enable to produce 185 ML/day of treated water from Nzove WTW complex *(**Nzove I – 80** (12.7 + 67.3) ML/day, Nzove II - 40 ML/day, & Nzove III - 65 (40+25) ML/day*).
3. **Option 3:** Utilize existing capacity, i.e. 110.5 ML/day of the Large raw water abstraction work and upgrade the Small raw water abstraction work to 28.7 ML/day. Ultimately the treated water from Nzove WTW complex will be 145 ML/day. (**Nzove I – 40** *(12.7+27.3)* ML/day, Nzove II – 40 ML/day, & Nzove III - 65 ML/day).
4. **Option 4:** Utilize existing capacity, i.e. 110.5 ML/day of the Large raw water abstraction work and upgrade the Small raw water abstraction work to 42.1 ML/day. This option assumes additional resource (28.7 ML/day) from ground water. Ultimately the treated water from Nzove WTW complex will be 185 ML/day. (**Nzove I - 80** ML/day (50% GW & 50% SW), Nzove II - 40 ML/day, & Nzove III - 65 ML/day).

5.3 Water Treatment Process Design Options (PD)

The options proposed here are for water treatment process as the WTP inspection has indicated the gaps in treatment efficiency because the treatment being done is not reflecting the initial treatment system design. There was some amendments as local arrangement by operators of the plant when some of the treatment units became non-functional. The four process design options considered to treat raw water to acceptable potable quality for Nzove I WTW project are:

1. **Option 1**: Reinstate process design as originally planned, operating at 40 ML/day with raw water supplied from ground water source. This will require new boreholes etc., but the main advantage is that the existing process is retained.
2. **Option 2:** Amend the design, increase the capacity to accept 80 ML/day from groundwater source, introduce aeration & sedimentation, convert biological filter to rapid gravity sand filter, re-instate rapid gravity sand filter bank 2, total combined capacity 80 ML/day
3. **Option 3:** Abandon groundwater source, change to river abstraction, introduce aeration & sedimentation, mothball biological filter, re-instate rapid gravity sand filter, 40 ML/day total. Theoretically, in this case, the biological filter can be mothballed for future use. Our recommendation would however be to change it to a rapid gravity sand filter and to use both filter banks to purify the 40 ML per day. This will lead to a very conservative loading rate of approximately 3,5m/h which will have the benefit of longer filter runs and less frequent backwashing.

4. **Option 4:** Abandon groundwater source, change to river abstraction, introduce aeration & sedimentation, convert biological filter to rapid gravity sand filter, re-instate rapid gravity sand filter bank to, 80ML/day total. This option will be the ultimate solution for Nzove I. It will require full 80Ml/d aeration, coagulation, flocculation and sedimentation prior to the filtration on the existing biological filters (converted to rapid gravity sand filters) and the existing rapid gravity sand filters.

From the four, option 1 was selected as it allows the rehabilitation of Nzove I WTP without changing its initial design. The option 2 was not selected as it requires the change in the infrastructures settings and layouts by incorporation of the additional treatment units and likely to look as a new project instead of rehabilitation and thus incurring much investment by demolishing the existing one. Option 3 and 4 require to abandon the existing infrastructures put in place for groundwater while there are still working though partially.

5.4 Clear Water Distribution Options - PS & Water Mains (TW).

These options for treated water transmission consisted mainly at upgrading the clear water pumping system for the possibility of conveying water to Ntora main reservoir. With the project for strengthening Nzove-Ntora pipeline executed by JICA-Rwanda, the pumping system for clear water was constructed and upgraded and a new 900mm pipeline was constructed near the existing 600mm transmission pipeline and this JICA work was done to accommodate all production capacity possible if the Nzove I, II and III are working to their maximum capacities. Therefore, the remaining works recommended is to rehabilitate the 600mm diameter pipeline as described in section 8.4 of the executive summary.

The Clear Water Distribution Options identified for pumping water produced at the Nzove I WTW, comprised of elements of Water Collection, High Lift pumping and rising mains all terminating at the Ntora Reservoir Group. The four options are:

1. **Option TW1 A** - This option describes the pumping of 55 ML/day from the existing Nzove I WTW pumping station supplied by the Nzove I WTW 2 ML clear water tank. The clear water tank will receive 40 ML/day from the refurbished Nzove I WTW and 15 ML/day from Nzove II WTW routed through the Nzove I WTW clear water tank. The 15 ML/day from Nzove II WTW is based on a treatment capacity of 40 ML/day of Nzove II WTW of which 22 ML/day will be handled by a new pumping station for Nzove II WTW and 3 ML/day pumped by a further different pumping station.
2. **Option TW1 B** - This option describes the pumping of 40 ML/day from the existing Nzove I WTW pumping station supplied through the Nzove I WTW 2 ML clear water tank. The clear water tank will receive 40 ML/day from the refurbished Nzove I WTW. The 15 ML/day produced by the Nzove II WTW and currently being routed to Nzove I WTW will be added to the 22 ML/day for which the Nzove II WTW pumping station has been planned by other Consultants. This means the capacity of the Nzove II WTW pumping station will need to be increased to 37 ML/day under Option TW1 B.
3. **Option TW2 A** - This option describes the pumping of 55 ML/day from the existing Nzove I WTW pumping station supplied by the Nzove I WTW clear water tank. The clear water

tank will receive 40 ML/day from the refurbished Nzove I WTW and 15 ML/day from Nzove II WTW routed to the Nzove I WTW clear water tank. The additional 40 ML/day that is available from Nzove I WTW under the 80 ML/day design upgrade, will be routed via a gravity link from the Nzove I WTW Clear water tank to the 2 ML Nzove III Clear Water Tank where the western side of the Nzove III WTW pumping station will be equipped with pumps sized to pump 40 + 25 = 65 ML/day to Ntora Reservoir through a new 900mm rising main.

4. **Option TW2 B -** This option describes the pumping of 40 ML/day from the existing Nzove I WTW pumping station draining to a 2 ML clear water tank. The 37 (15 +22) ML/day produced by the Nzove II WTW will be routed under gravity to Nzove II WTW pumping station. The second 40 ML/day produced by the Nzove I WTW will be routed under gravity to the Nzove III pumping station clear water tank from where it will be pumped, together with future 25 ML/day from Nzove III WTW to the Ntora Reservoir group through a new 900mm steel line.

For each of these options, costing estimates were prepared based on preliminary designs. Furthermore, an environmental impact analysis was done and presented. All options were evaluated based on technical, financial and environmental criteria. The results of this analysis are presented by the schemes as detailed below:

Scheme 1: with 40 ML/day Capacity

Whilst there was not much difference between options involving the use of ground water as a raw water source, it was clear that Scheme No 1, which is the combination of Ground Water Options 1 (GW1), Water Treatment Process Design Option 1 (PD1) and Treated Water Distribution Option 1 (TW1) is a clear winner in terms of capital cost required (**23.895** Million USD), Life-cycle cost (**82.529** Million USD), lowest production cost (**0.318** USD /m^3 or **289** RWF/m^3 of treated water) and lower environmental impact.

Scheme 2: with 80 ML/day Capacity

The supply gap between the projected water demand of part of Kigali that is being supplied from Nzove WTW complex and the existing production capacity of Nzove WTW complex shows an increasing trend. The gap is estimated to be 40 ML/day by the year 2025 and will increase to 80 ML/day by 2032. Hence, the need to assess a possible scheme with 80 ML/day production capacity. For schemes with 80 ML/day production capacity, there was not much difference between options involving the use of surface water as a raw water source. Hence, the only ground water option.

Scheme 3, which is the combination of Ground Water Options 3 (GW3), Water Treatment Process Design Option 2 (PD2) and Treated Water Distribution Option 2 (TW2) is a clear winner in terms of capital cost required (Phase 1 - USD **25.670** Million & Phase 2 – USD **16.938** Million), Life-cycle cost (**137.169** Million USD), lowest production cost (**0.356** USD /m^3 or **323** RWF/m^3 of treated water) and lower environmental impact.

Based on combined technical, economic, social and environmental criteria the Option GW1b: Rehabilitate as much of the existing system as possible, adopting the same or improved design for

new/replacement BH's that will replace units that are no longer functional to meet the required 40 ML/day production has been selected as the best alternative.

5.5 No Project alternative

The objective of the WASAC Ltd. is to provide continuous, satisfactory and sustainable water supply and sewerage services to all customers within Rwanda. Water demand for the growing population in Rwanda is high and will continue to be so. The present project will be used to meet medium and long term water demand at the national level especially in Kigali City.

Thus, there is no feasible No-Project option for this Project if the aim shall be reached to extend the water supply of the population as soon as possible and to reach full coverage in the long term. The "No Action Alternative" is not recommended, as we need to encourage sustainable development related to water supply.

CHAPTER 6: STAKEHOLDERS CONSULTATION AND PUBLIC PARTICIPATION

6.1 Background

Consultation and participation is a process through which stakeholders influence and share control over development initiatives, and the decisions and resources that affect them. It is a two-way process where the executing agencies, policy makers, beneficiaries and affected persons discuss and share their concerns in a project process. According to the AfDB policies, project affected persons and host communities are to be meaningfully consulted early in the planning process and encouraged to participate in all stages up to the implementation of the project. Prior to commencement of works and during ESIA scoping and sites visits, consultations were held with potential PAPs, neighbouring communities of the project area and local leaders and client personnel.

6.2 Objectives of the public consultations

The specific objectives of the ESIA public consultation process are to:

- Make the ESIA study participatory and transparent;
- Share the potential positive and negative environmental and social impacts and their proposed mitigations;
- Inform the PAPS about their right and how they will be put in actions;
- Explain and make the compensation process transparent, but more detailed in the ARAP,
- Determine the attitudes of PAPS towards the proposed projects; and finally
- Provide a platform for future consultation by:
  - ✓ reducing conflict through early identification of contentious issues;
  - ✓ improving transparency and accountability of decision making;
  - ✓ facilitating participation to increase public confidence in the ESIA process;
  - ✓ Identifying stakeholders with whom further dialogue will be constructive in subsequent stages of the project.

6.3 key Stakeholders Consultations

Discussions with decision making bodies, key stakeholders, sector institutions and environmental experts were made on the very concepts and nature of the proposed project and the importance of Water supply projects, giving emphasis on levels of public participation, role of key stakeholders and joint contributions of these actors to the success of the project. In addition, the scope of the proposed project and possible means of maximizing local communities' social, economic and environmental benefits from the project implementation were underlined.

Table: 6.1. List of consulted people

No	Names	Institution	Position	Date of consultation
1	Eng. MUZOLA Aimé	WASAC	CEO	19/10/2020
2	GASHUGI Innocent	WASAC	Manager WoS	19/10/2020
3	NDAGIJIMANA Joseph	WASAC	Project Manager	19/10/2020
4	BIZIMUNGU Jean Bosco	WASAC	Senior Water Engineer	19/10/2020

5	MUREKEZI Dominique	WASAC	Manage,Infrastructure Planning	19/10/2020
6	BUSHAYIJA Yasin	WASAC	Head of Nzove WTP	19/10/2020
7	BYANYIMA Ben	WASAC	Environmental Specialist	20/10/2020
8	NSABIMANA Eric	WASAC	GIS Engineer	20/10/2020
9	HABIYAMBERE Emmanuel	WASAC	Water Engineer	20/10/2020
10	DUSHIMIRIMANA Valens	WASAC	Water Engineer	20/10/2020
11	NGENDAHAYO Emmanuel	WASAC	R&D Specialist	20/10/2020
12	UWANYIRIGIRA Clarisse	Kanyinya Sector	Executive Secretary	22/10/2020
13	HABAMUNGU Abdallah	Nzove Cell	Garage Owner	22/10/2020
14	MANIRAKIZA Dedine	Nzove Cell	Business woman	22/10/2020
15	TWAGIRIMANA Desire	Nzove Cell	Cyclist	22/10/2020
16	MASABO Jean Claude	Nzove Cell	Farmer	22/10/2020
17	MUKANKUBANA Mary	Nzove Cell	Local resident	22/10/2020
18	NTIGURIRWA Emmanuel	Nzove Cell	Local resident	22/10/2020
19	MANOVERI Vincent	Nzove Cell	Local resident	22/10/2020
20	MUKAHIRWA Jose	Nzove Cell	Local resident	22/10/2020
21	GAKUBA Fulgence	SMEC	Country Manager	23/10/2020
22	CORRIE Marx	SMEC	Treatment Expert	23/10/2020
23	NEIL Meyd	SMEC	Hydraulic Engineer	23/10/2020
24	GEBRESELASI Giji	SMEC	Team Leader	23/10/2020
25	TABARO Emmanuel	SMEC	Chief surveyor	23/10/2020
26	RUGWIRO Bonny Francis	SMEC	Surveyor	23/10/2020

6.4 Consultation with local residents

Local residents in the project areas have been consulted but due to COVID-19 pandemic it was difficult to gather many people (therefore postponed). The project shall affect few people as the activities shall be limited to trenches excavation. The main objective of the public consultations was to gather information on their concerns, perceptions, reactions and fears of the livelihood changes to be brought about as a result of the Project. Other specific objectives were to:

- Explain the project in deep to local people;
- Obtain socio- economic and environmental information on the community;
- Explain the process of the ARAP and its importance;
- Introduce resettlement grievance mechanism to people.

Communities were given some detailed information about the project through a presentation by consultant team. The presentation highlighted the project background, objectives, expected upcoming activities, potential socio-economic and environmental impacts. After the presentations the community was given opportunity to give their views, comments and queries. Questions were answered, clarifications offered and their recommendations received.

Public consultation meetings were postponed due to COVID-19,these consultations resumed and held in all the villages visited and located in the project's direct area of influence as well as at District level where key project stakeholders were invited.

At village level, with support from chiefs of villages, meetings were hold at cell offices bringing together people from concerned villages. Consultations started from 11/06/2023 and ended on 14/06/2023.

At cell level, in collaboration with District one stop centers, the consultation meetings were organized on 13 June 2023. cells invited the stakeholders in water and sanitation including Water, Sanitation and Hygiene board (District WASH Boards), representative of WASAC.

In general, the project was appreciated by all interested stakeholders as it will contribute to the national target of covering the whole country with access to clean water and thanked the Government of Rwanda for promoting modern households in their villages.

Photos taken Consultation meeting and participation

6.5 Key Outcomes and Findings from the consultations

Meetings were arranged to have a general and same understanding on the benefits and negative effects of the project. This meeting raised the flow discussions on the following:

- The need of the project,
- identification of different problems related to the project,
- Related socio-cultural and economic parameters to be considered in enhancing and mitigating associated positive and negative impacts respectively.
- Suggestions and propositions on what can be done to address raised problems due to the properties to be affected.

Table: 6.2. Summary of issues raised and response during public consultation

Issues at hand	Response to issues at hand
Perceptions and awareness of the public in relation to the proposed project.	Consulted people in the project areas were not aware of the project, but they agree and acknowledge the excellent/considerable importance of the project after the consultant explained the project objectives, scope and implementation schedule.
Expected risks and negative effects of the Project to the local community like loss of crops, fruits and trees	It was explained that whenever compensation shall be required, affected properties shall be compensated as per the national Expropriation Law.
Anticipated benefits likely to be occurred from the project for stakeholders.	Project benefits were explained and identified as: o Increased income for different employed personnel that will contribute to the development of the project; o Increase of water which will enhance and promote hygiene and sanitation; o The project is located in areas that suffer during dry season. This project will be a solution of water problem during dry season; o Improved wellbeing of our families
The willing to accept and participate in resources mobilization for all involved stakeholders.	Kanyinya sector to arrange and assist the compensation.

6.6Key Stakeholder views and suggestions

Stakeholders consulted had the views summarized in Table 6-3 below some of which were utilized in above impact identification and analysis.

Table 6.3: Key issues by the stakeholders. (Source: Consultant)

Subject	View	Remarks
Employment	• There was a concern on whether local communities will be involved and employed during construction of the proposed facilities. The contractor should consider employing the local people in the project implementation/development areas and the procedure he will follow to engage them spelt out. • The village has a number of people who have qualifications in plumbing, therefore when looking for plumbers; the contractors should also consider employing them.	▪ Recommendation will be made to give priority to the local skills available before getting other people from elsewhere.
Compensation	• Can structures such as houses be constructed above the pipeline after construction works are completed. • Communities inquired whether graves will be compensated and who will remove and relocate the graves found within the proposed project sites? • The communities were concerned whether all crops within the corridor likely to be affected will be compensated? • The communities inquired the fate of a PAP whose land is small in size and the remaining portion is not sufficient for any development. • The developer should speed up the process of compensation • What assurance does WASAC give to communities as regards to timely and prompt compensation for the affected people because earlier projects promised they would compensate though they didn't fulfil their promise.	• No structures will be permitted above the pipeline whether temporary like kiosks or permanent. However, the land above the pipeline can continue being utilised for agricultural purposes. • WASAC will compensate the PAPs appropriately and give them an additional disturbance allowance that should allow the PAPs to cater for the removal/relocation of the graves. • All affected crops (perennial or annual) with in the project corridor will be compensated. • If remaining portion of land acquired is too small for constructive use, the developer will acquire the entire parcel and the PAP will be fully relocated. • WASAC intends to follow the appropriate procedure in

		implementation of this project as recommended by the funders. In addition, WASAC will set up a grievance committee to address issues arising from the compensation process.
Sensitization	▪ The developer should design and implement a program to sensitize the surrounding communities on the use of the facilities ▪ WASAC should undertake regular monitoring of the water quality in raw waters and keep the community/public informed. ▪ The contractors should create good relationship with the communities through consultations prior to construction activities so that the communities have a role in the management of the systems.	• The suggestion was noted for conveyance to WASAC and feedback will be provided subsequently. • WASAC will be acquainted with the concerns and measures out into consideration. • Consultation is a continuous process. Contractors will have a sociologis who will be in touch with communities and will communicate to PAPs prior work starts.
Stakeholder engagement and awareness creation	• There should be continuous and effective communication with stakeholders at all stages of the proposed development. For instance affected persons should be provided with project timelines to enable them plan to vacate affected areas in adequate time. Information about the project should be availed to local people in native languages for effective disclosure, engagement and meaningful feedback.	Stakeholder consultation is a continuous process and at all stages, the PAPs will be informed with the help of the local leaders. WASAC will give notice to vacate the acquired land after compensation.
Land	• Will PAPs be able to use the land again after it is acquired by the project? • WASAC should construct the proposed pipeline close to the already existing lines or improve on the already existing lines other than traversing through people's land.	• The land within the project corridor once acquired will be restricted to simple cultivation but no developments will be permitted within that area. • The study will guide on the best routes for the lines.

Benefits	• How and when will communities benefit from the proposed project? ▪ Once pipes have been laid, after how long will they be able to supply water to the communities?	• Communities will benefit from the project both during and after construction through job opportunities, market for community products and resources, improved supply and access to piped water in the long run. • These are transmission pipes that take raw water to the treatment plant. After treatment of the raw water, WASAC plans on expansion of distribution network to communities that will have water shortages and willing to pay.
Pipelines	• WASAC already has the existing networks, will the new network reinforce the existing ones? • The communities were inquiring when and where exactly will the pipeline be laid?	• The study will guide on the best routing. • Surveyors will survey the pipeline routes
On maintenance	• WASAC should make sure that regular maintenance of the proposed facilities is done. Usually they take a long time to respond to communities in case they report water systems damages for example bursting of the pipes.	This concern was noted for conveyance to WASAC for consideration with recommendation that WASAC establishes a dedicated toll-free complaints hotline where customers can register their complaints directly to the technical task force.

6.7. ESIA disclosure

Public disclosure of ESIA report is a requirement of the AFDB's ISS. WASAC will make available copies of this ESIA report on WASAC website and at its headquarters' office. Copies will be also shared with RDB and REMA for monitoring purposes. The GoR will also authorize AfDB to disclose this ESIA report.

CHAPTER 7: ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

7.1. Introduction

The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise from the undertaking of an activity of the project implementation and findings used to inform the competent authority's decision whether the activity should be either authorized, authorized subject to conditions that will mitigate the impacts to within acceptable levels, or refused.

In this sense, impacts are defined as the changes in an environmental or social parameter that result from undertaking an activity. These changes are the difference between effects on an environmental or social parameter where the activity is undertaken compared to that where the activity is not undertaken, and occur over a specific period and within a defined area.

This section entails assessment of impacts of the water supply project. By nature, the proposed project has potential to cause negative as well as positive impacts on the biophysical environment and socio-economic setups. The magnitude of which will vary between the phases of project implementation. The assessment of the project impact given below is for the proposed intervention areas for the rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali.

The developer of the project (WASAC) in collaboration with the supervisor and contractors shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in the Environmental and Social Management Plan. The contractors shall ensure that the negative impacts are avoided, minimized or mitigated.

7.2. Impacts Types

Different types of impacts may occur from the implementation of this type of project, which may be positive or negative, and can be categorized as being either direct (primary), indirect (secondary) or cumulative.

Direct impacts are impacts that caused directly by the activity and generally occur at the same time and at the place of the activity (for example, dust generation due to excavation activities). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Indirect impacts are induced changes that may occur as a result of the activity (for example the use of water from a natural source at the activity will reduce the capacity for supply to other users). These types of impacts include all the potential impacts that either do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (for example, removal of vegetation may cause soil erosion, leading to excessive sediments in receiving stream, leading to reduced sunlight penetrating the water and thus reducing dissolved oxygen in the water and adversely affecting aquatic life and water quality). Cumulative

impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts (Jain et al, 1993).

7.3. Identification of Potential Impacts

Potential impacts associated with the project were identified basing on the qualitative information and data on cause-and-effect relationship. The identification considers the sources of impacts and relate them to the environmental or social characteristics and conditions; hence concluding if the source of impact affect or not the specific environmental or social components of the project activities. The impacts identification considers the all stages of the project: design and planning, implementation, operation and decommissioning.

7.4. Impact Assessment methodology

The methodology used for impact assessments in this report is related to risk assessment (whereby certain impacts to the environment are identified), risk evaluation (by using a stipulated assessment criteria whereby impacts are given a rating or weighting and obtaining an overall rating or significance of an impact) and risk management (relating directly to applicable mitigation measures to be implemented to manage a risk of an impact in the best interest of the project beneficiaries and surrounding communities.

The assessment criteria and ratings for determining the impact significance based on the following:

(i) **Nature or status of the impact**: the type of the effect the activity would have on the environment that can be:

- *Positive*: has a benefit to the holistic environment
- *Negative*: has a cost to the holistic environment
- *Neutral*: has no cost or benefit

(ii) **Effect of the impact:** the result of the activity on the environment

- *Direct: the activity has a direct impact on the environment or human*
- *Indirect: the activity has an indirect impact on the environment or human*

(iii) **Duration of the impact**: the lifetime of the impact:

- *Short term*: less than 2 years
- *Short to medium*: 2 to 5 years
- *Medium term*: 6 to 25 years
- *Long term*: 26 to 45 years
- *Permanent*: 46 years or more

(iv) **Extent or scale of the impact:** the distance from the source that impacts may be experience:

- *Site specific*: within the site boundary
- *Local:* affects immediate surroundings areas
- *Regional:* extends substantially beyond the site boundary
- *National:* affects country

- *International:* crosses international borders

(v) **Reversibility of the impact:** to what degree its influence on the relevant environment can be negated:

- *Completely reversible*: reverses with minimal rehabilitation and negligible residual effects
- R*eversible*: requires mitigation and rehabilitation to ensure reversibility
- *Irreversible:* cannot be rehabilitated completely/ rehabilitation not viable

(vi) **Intensity or magnitude of the impact:** severity of the negative and magnitude of positive impacts:

- *Low:* little effect- negligible disturbance/benefit
- *Low to moderate*: effects observable-environmental impacts reversible with time
- *Moderate*: effects observable-impacts reversible with rehabilitation
- *Moderate to high*: extensive effects – irreversible alteration to the environment
- *High:* extensive permanent effects with irreversible alteration

(vii) **The probability of the impact:** describes the likelihood of the impact actually occurring:

- *Unlikely*: less than 15 % sure of an impact occurring
- *Possible:* between 15% and 40 % sure of an impact occurring
- *Probable:* between 40 % and 60 % sure that the impact will occur
- *Highly probable:* between 60 % and 85 % sure that the impact will occur
- *Definite:* Over 85 % sure that the impact will occur

7.5. Positive Socio-economic impacts

The project will result in many social-economic benefits for the beneficiaries and surrounding communities of the project. It is expected that the project will result in better access to safe drinking water and sanitation services leading to improved standard of living in terms of reduction of water borne diseases, creation of temporary employment during construction, economic development due to money circulation in the project area from wages, knowledge transfer between contractor experts and local employees, etc. Some of the possible potential impacts are summarised in the table below while the details on each impact are provided under the same table.

Impact	Significance	Duration
– Job opportunity for local people and gender balance enhancement in terms of employment benefits.	Important/High	Temporary and permanent.

– Knowledge transfer to local people.	Important/High	Temporary.
– Possibility of business hiring equipment.	Moderate/Middle	Temporary.
– Selling foodstuff and other materials.	Moderate/Middle	Temporary.
– Increase income for the population working for the project.		Temporary and permanent.
– Possibility of savings for workers.	Important/High	Temporary and permanent.
– Increase to public revenues/taxes for both central and local authorities from construction materials.	Important/High	Temporary and permanent.
– Drinking water quality that meets national, regional, and international quality indicators.	Important/High	Permanent.

The following section highlights the potential social-cultural and economic impacts of the envisaged project.

7.5.1 Job creation for local residents

Relevant project phase: This impact is expected during the constructions phase, operation phase and decommissioning phase because during construction of the project, there will be huge civil works that require labour force with and without formal education, formal and informal technical knowledge. The concept id to give priority to local residents. During operation phase, the new WTP will require staff to operate the system, there will be need of other workers like cleaners, manpowers, etc, all required for the system to operate. In addition, supplying consummables to the plant generate employment to many traders Similarly, during decommissioning, civil works require manpowers and formal education employees. All these cause circulation of money in the project area and impacting more employment opportunities

ii) Description of the impact: The implementation of this project will provide employment opportunities for the project areas local residents. The use of local labourers and skilled workers will improve the skill resource base in Rwanda through the implementation of training and development programmes. These are both positive outcomes of the project and for the local population. However, there will be an influx of people looking for work in general. If not carefully managed, this strain would be a negative impact.

Revenues generated will be distributed through the creation of temporary or permanent job for the local personnel or the supplying material at different sources.

Referring to concrete impact, the mass of money which will be distributed within the zone of the project, will contribute to the improvement of the quality of life, the accessibility to health treatments and to opportunities of trade.

7.5.2 Contractor employment leading to economic and skills diversification

i) Relevant phase: During construction phase as the contractor shall be undertaking execution of all works and during operation phase as it is expected a two years' liability period for the contractor.

ii) Description of the impact: The use of local contractors will increase their capability to carry out their work competently. There will also be an influx of skilled contractors to the project site. This will help to set up economic diversification.

7.5.3 Access to reliable potable water supply

i) Relevant phase: During the operation phase because water will be being produced and supplied

ii) Description of the impact: Once completed, this water supply project will result in better access to safe drinking water. The improvement and expansion of water supply system will enable greater responsiveness to the water demand, increasing also the reliability of the operating system and thus removing extra expenses on water sales used to be during water shortages or cuts .

The project will create conditions for improving the lives of Kigali City residents and its surroundings by providing more efficient access to water supply services. The availability of quality water will help in reducing the incidence of waterborne diseases, increasing the welfare of local people. This will be a positive impact of the project and great motivation for its implementation.

7.5.4 Compatibility with the scale of economic development

i) Relevant phase: During the operation phase as the impact will be caused by availability of water to users

ii) Description of the impact: This water supply project as a whole will have positive impacts due to the increased availability of potable water, which will allow create opportunities to open up other development projects that require regular water availability in their operation such as processing small scale enterprises.

7.5.5 Potential creation of synergies with other sectors

i) Relevant phase: During the operation phase as the impact will be caused by availability of water to users

ii) Description of the impact: The water supply project will create synergies with the health and education sectors due to its influence in reducing the incidence of waterborne diseases that result from the availability of quality water by increasing the welfare of local people. Children who spend part of their day in fetching water will have more time to study if there is water availability, as does the productive population that will have more time for other productive activities.

7.5.6 Knowledge transfer

i) Relevant phase: During the construction phase as local technicians and workers will gains the know-how by implementing different works with guidance from the experts of the contractor. It is also relevant in operation phase because it is expected a capacity building from the contractor to WASAC during the operation phase in order to master the use and functionality of the electromechanical systems to be installed as well as any device installed.

ii) Description of the impact: Technical and planning skills will be gained by the Rwandese people that will be employed by the project and this is likely to contribute to the capacity building in management, engineering and health and safety.

7.5.7 Local socio-economic diversification and improvement

i) Relevant phase: During construction, operation and decommissioning phase because in this time there will be influx of migrant workers to project areas who will gain by their wages the improved purchasing capacity and more money circulation that will improve the socio-economic status local residents in the project area.

ii) Description of the impact: It expected that all works related to the project will provide a positive increase to the local and national economy in general this will contribute to the socio economic benefits within and around the project area. The economic expansion will enable alternative businesses and economic activities to develop. Also, increased earnings by staff will most likely be spent locally further supporting already established businesses in the area, as well as potential new businesses that may emerge.

7.5.8 Gender balance enhancement

i) Relevant phase: Mostly during construction and decommissioning for job opportunities balance and during operation phase to alleviate the burden to females to hardly getting water

ii) Description of the impact: It is expected that during the project implementation women will equally benefit as men in terms of employment benefits. In Rwandan culture, it is the responsibility of a woman to collect water and during water shortages, women and girls use most of their time for water. Therefore, with the envisaged project water will be highly beneficial to women and girls and reduce the burden of fetching water.

7.5.9 Access to healthcare

i) Relevant phase: construction and decommissioning as many works as more money gained and the capacity to afford medical insurance schemes

ii) Description of the impact: Projects' employees and their immediate families will be provided with basic healthcare. This will benefit the overall health of the local population. HIV/AIDS information will be dispersed to employees to prevent the spread of the disease amongst the project employees and their families.

7.5.10 Saving possibilities

i) Relevant phase: construction, operation and decommissioning

ii) Description of the impact: The increase of the project's employee's revenue from salaries will lead to the possibility of savings in local banks and micro-finances and hence, may easily access to small credit to invest in other activities such as construction of houses or in agriculture or livestock activities.

7.5.11 Increase of public revenues and taxes

i) Relevant phase: construction Phase as it is expected from residents to gain more money from works and create other businesses that will provide taxes. Moreover, the contractor will be providing taxes during his employment in project implementation. The operation phase is also

relevant as the workers in the new systems will be subjected to salaries and related taxes, pension and insurance schemes, etc

ii) Description of the impact: The implementation of the project will increase revenue and taxes for both the central (Rwanda Revenue Authority) and local authorities. The project will fully participate in increased payments of taxes from suppliers of the clean water in the project areas.

7.6. Potential negative socio-economic impacts and mitigation measures

It is expected that the rehabilitation of Nzove 1 water treatment Plant and water distribution network in Kigali project will have also some socio-economic adverse impacts as detailed in the present section.

7.6.1 Conflict among workers and local population

i) Description of the impact: Projects involving major works include, often, the potential for the occurrence of social conflicts between workers who temporarily settle in the local and community residents. Such behaviours are generally related to socially unacceptable behaviour according to local social standards and can be seen, for example, cases of drunkenness and disregard/lack of respect for local customs. This impact should be considered even though an important part of the manpower to be recruited locally.

ii) Relevant phase: Construction and operation phase

Impact type and classification						
Direct	Negative	Short term	Local	Reversible	Low	Probable

Mitigation measures

- In the dialogues of social issues, should explain to workers about the importance of keeping a good relationship with local communities;
- Amongst the local workers should be a group of community liaison, responsible for establishing communication between project staff and community, which will be particularly important in cases of complaint. Such elements should be familiar with the project in general and being able to properly troubleshoot or forward any complaints/claims;
- Should be established and implemented a set of rules for the workplace. The standards should include, inter alia, the entry of persons outside the service.

7.6.2 Accidents and injuries

i) Description of the impact: The most common injuries or accident result from manual handling are musculoskeletal disorders in various parts of the body (back, neck, shoulders, or other) and include from sprains and strains to damage to muscles, joints and vessels. Other injuries include cuts, bruises, lacerations and fractures due to unexpected events such as accidents caused by manual handling or lack of proper PPEs. During operation, improper handling, running, and operation of electromechanical equipment or improper handling of chemicals may cause accident. During demolition works (decommissioning) , not paying attention equals accidents

ii) Relevant phase: Construction, operation and decommissioning phases

Impact type and classification						
Direct	Negative	Short term	Site specific	Irreversible	Moderate	Probable

Mitigation measures

- Providing information and induction training to all workers on tasks, and the use of equipment and correct handling techniques. Workers must be instructed during toolbox meetings about the risks a certain manual handling could have;
- Manual work must be carried out by workers having the physical conditions to undertake the tasks without any risks to their health (consider experience and familiarity with the job, age and historical of injuries);
- Sufficient breaks must be implemented and organized to ensure the possibility for having a rest from repetitive tasks or heavy manual handling, especially under hot ambient conditions. The arrangements for breaks must be communicated to all concerned workers;
- Suitable and proved PPE must be provided to each worker at no cost;
- Ensure first Aid Kits are available on site and a permanent safety officer is recruited

7.6.3 Traffic congestion and risks of accidents

i) Description of the impact: Given the nature of the project, traffic of vehicles in the project areas is likely to increase due to project vehicles, staff vehicles, visitors' vehicles and materials supply vehicle and may affect negatively the existing traffic flow.

In addition, the use of lifting equipment, movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, and noise. Causes may be: people struck or run over by moving vehicles (e.g. during reversing), causing minor to major injuries (fractures, wounds) or death; falling from vehicles, causing injuries or death; and injuries or death due to vehicles overturning.

ii) Relevant phase: Construction phase

Impact type and classification						
Direct	Negative	Short term	Local	Irreversible	Moderate	Probable

Mitigation measures

- The incidence of road accidents involving project vehicles during construction and operation phases should be minimized through a combination of education and awareness-raising.
- Prevention and control of traffic related injuries and fatalities should include the adoption of safety measures that are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents.

- Provision of traffic signs and humps where needed for speed reduction will be necessary.

7.6.4 Health issues

i) Description of the impact: Due to excavation and construction activities, there is likely the generation of dust and exhaust fumes from the vehicles and machineries. Inhalation of dust, smokes and exhaust fumes can result in possible respiratory irritation, discomfort, or illness to workers if not properly mitigated.

ii) Relevant phase: Construction phase

Impact type and classification						
Direct	Negative	Short term	Local	Irreversible	Moderate	Definite

Mitigation measures

- Use of wet processes (excavated soil stored close to the trench must be regularly watered to prevent the generation of dust);
- Use of Personal Protective Equipment may be vital, but it should nevertheless be the last resort of protection (PPE should not be a substitute for proper dust control and should be used only where dust control methods are not yet effective or are inadequate).

7.6.5 Risks of HIV/AIDS, STD and COVID 19 transmission

i) Description of the impact: Due to the increase of people from outside of the project zone and the interaction with the local communities, there is a risk of increase of HIV/AIDS and other sexual transmitted diseases and propagation of COVID 19 if proper measures are not taken.

ii) Relevant phase: Construction

Impact type and classification						
Direct	Negative	Long term	Regional	Irreversible	High	Highly probable

Mitigation measures

- Carry out awareness programme for HIV/AIDS, STD and COVID 19 awareness, prevention and voluntary testing
- Provide free condoms and place them at discrete but accessible areas,
- Ensure all workers have medical insurance Mutuelle de Santé" or other insurance
- Ensuring ready access to medical treatment, confidentiality and appropriate care, particularly with respect to migrant workers
- Promoting collaboration with local authorities to enhance access of workers' families and the community to public health services and promote immunization.
- In particular, for COVID 19

(i)	WASH HANDS: frequently wash hands with soap and clean water for at least 20 seconds or an alcohol-based hand sanitizer
(ii)	AVOID HANDSHAKES: Greet people with a wave, bow, or nod
(iii)	SNEEZE OR COUGH: Cover mouth and nose with flexed elbow or tissue, throw tissue away and immediately wash hands
(iv)	AVOID CLOSE CONTACT: If experiencing fever, cough, sneezing avoid contact with others and stay home when sick
(v)	CLEAN AND DISINFECT: Clean and disinfect surfaces around your home and work

7.6.6 Disruption of public utilities

i) Description of the impact: At several points, small domestic water supply pipe lines and electricity and communication cables were observed. Due to nature of the water supply project activities during construction, these infrastructures are likely to be affected/damaged by the construction activities and create disruption of water, electricity and internet services to local residents and neighbouring communities.

ii) Relevant phase: Construction

Impact type and classification						
Direct	Negative	Short term	Regional	Reversible	Low	Highly probable

Mitigation measures

- The contractor in collaboration with WASAC will be required to: (i) plan for immediate attendance by the service providers to any damages to utilities during construction; (ii) replace (or compensate for) public and private physical structures damaged due to construction and (iii) provide prior public information about the likely disruption of services.
- Coordination with relevant authorities to identify and map the location of existing underground utilities such as electricity and communication cables.
- In consultation and with support from WASAC, the contractor will provide alternate arrangements for water supply in the event of disruption beyond reasonable time.
- Where practical, the contractor shall work carefully to avoid damages to the water pipe lines, electricity and communication cables. Roads and pathways cuts should be done without interrupting normal traffic and preferably to be planned during nights.

7.6.7 Gender based Violence and Child Abuse and Exploitation

i) Description of the impact: Given the number and diversity of workers under the water supply project, there are high risks of Gender based Violence (GBV) among project workers or with the neighbouring communities and risks of Child Abuse / Exploitation (CAE) due to labour influx. Child Labour law violation may also take place if proper mitigation measures are not put in place.
ii) Relevant phase: During construction phase and decommissioning phase where a lot of work is available

Impact type and classification						
Direct	Negative	Short term	Local	Reversible	Low	Highly probable

Mitigation measures

- Awareness programme should be prepared to all workers on the avoidance and related risks to GBV and CAE;
- The contractor should be aware on labour Law and most importantly the article on the Child Labour;
- Female workers should be sensitized on their rights and encouraged to report any gender based violence or threat.

7.6.8 Site security and public security

i) Description of the impact: During construction phase, there is high risk of theft of construction materials such as pipes, joints, taps, iron bars and cement. It is also anticipated that neighbouring population may cross the project activities; hence a risk to their safety as unauthorized people.
ii) Relevant phase: Construction phase

Impact type and classification						
Direct	Negative	Short term	Site specific	reversible	Low	Possible

Mitigation measures

- There will be a restricted zone around existing and envisaged water storage tanks and pipelines.
- No unauthorized person will be allowed to enter these sites. WASAC in collaboration with local authorities swill keep the community informed regarding the project activities and future plans.

7.7. Adverse environmental impacts and mitigation measures

Projects' adverse impacts during project phases (pre-construction, construction, operation and decommissioning phases) are described in this section. The significance and probability of occurrence of each impact can be reduced through the application of environmental preventive and mitigation measures. Potential environmental issues associated with this project, which may require management, are discussed in the following paragraphs.

7.7.1 Soil erosion and water pollution

i) Description of the impact: Soil damage includes compaction and disturbance of the profile. Soil erosion involves transport of the soil downslope by running water or, more rarely but still a significant factor, away from the site by wind. Soil compaction and disturbance, usually accompanied by vegetation and litter layer damage, are preconditions for accelerated soil erosion. Most soil damage occurs as the result of movement of machine, trucking, and to some extent through felling of trees during excavation works. Soil erosion depends not only on soil damage but also soil type, rainfall, and angle and length of slope.

Contamination of soil may occur from the spillage of oils and lubricants during construction and operation activities. Degradation of the surrounding soil will affect surface waters, flora and fauna and may restrict the future land use.

ii) Relevant phase: It is mainly during construction works where soil works are done

Impact type and classification						
Direct	Negative	Short term	Site specific	Reversible	Low	Probable

Mitigation measures

- **Sediment mobilization and transport:** Reducing or preventing erosion by:
  - Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical
  - Contouring and minimizing length and steepness of slopes
  - Re-vegetating areas promptly
  - Designing channels and ditches for post-construction flows
- **Structural (slope) stability**
  - Providing effective short term measures for slope stabilization, sediment control and subsidence control until long term measures for the operational phase can be implemented
  - Providing adequate drainage systems to minimize and control infiltration
- **For surface water pollution, the following mitigation measures are suggested:**

- To immediately resurface and stabilize exposed surfaces.
- To backfill trenches as soon as pipelines are laid
- To properly Plan the disposal of surplus soils and demolition materials to designated areas

7.7.2 River water pollution

i) Description of the impact: Given that most of the project activities are close to Nyabarongo river, there are likely risks of polluting the river water due to dumping of construction materials, wastes and waste water by workers hence polluting and disrupting Nyabarongo river flow and water quality

ii) Relevant phase: During construction and operation phase.

Impact type and classification						
Direct	Negative	Long term	Site specific	Reversible	Low	Probable

Mitigation measures

- Ensure river is protected from soil falling from banks and drilling activities by retaining river banks using sand banks
- Carry out all possible activities far from the river banks
- Remove all waste in the river or near the river bans on regular basis

7.7.3 Noise and vibration emissions

i) Description of the impact: Noise and vibration during construction will be generated by the operation of heavy machines, heavy trucks, right of way preparation, soil stripping, trenching, pipe stringing, welding and laying and backfilling activities.

Blasting may also be required in certain areas where rocky substrates prevent trenching by other means. These impacts are of temporary nature. The noise and vibration can also be generated by electromechanical equipment during operation of the works.

ii) Relevant phase: During construction, operation and commissioning

Impact type and classification						
Direct	Negative	Short term	Site specific	Reversible	Low	Highly probable

Mitigation measures

- Restrict construction and operation of heavy machines to daylight;
- Ensure noise emissions are kept within the Rwanda standards;
- Inform local communities on the noisy activities schedule;
- Reduce needed truck movements by careful planning of needs of construction material;
- Vehicles will not be left turned on or idling at the site for longer than minimum amount of time required to complete site activities;
- All vehicles and construction machinery shall have an efficient muffler design in accordance with the manufacturer's specifications. This also includes high noise generating hand held like power drills, saws, nail guns etc. The mufflers shall be well maintained and regularly tested with the results documented in the maintenance logs;
- Regular and effective equipment maintenance in order to ensure all machinery is in good working order and use does not generate excess noise/vibration.
- All vehicles and trucks should have valid Vehicle Inspection Certificates delivered by the Rwanda National Police.

7.7.4 Dust and gaseous emissions

i) Description of the impact: Emissions of dust and exhaust fumes will occur while opening trenches and by the operation of vehicles during the transport of building material and equipment. Clearance of sites and excavation will also cause dust emission. In addition, exhausts from trucks and construction machines will also have a certain impact on the air quality.

ii) Relevant phase: During construction and decommissioning

Impact type and classification						
Direct	Negative	Short term	Regional	Irreversible	High	Highly probable

Mitigation measures

- Water the soil surface and any non-asphalted roads, especially in the dry season;
- Water the soil before starting excavating and during and after burial of the pipeline;
- The storage and handling of spoil, subsoil, topsoil and materials should be carefully managed to minimize the risk of wind-blown material and dust;
- Burning of any waste on site is prohibited;
- Vehicle engines must not be left running unnecessarily;
- Regular and proper maintenance of vehicles and machinery.

7.7.5 Temporary loss of habitat

i) Description of the impact: The construction phase will involve the use of heavy machines and vehicles and increase of circulation of people. For different purposes laydown yards will be needed, as for storage of parts and construction material, storage of pipes, parking of trucks and construction machines and work camps have to be installed. Vegetation will need to be cleared for excavation and trenching.

ii) Relevant phase: During construction

Impact type and classification						
Direct	Negative	Short term	Site specific	Irreversible	Low	Highly probable

Mitigation measures

- Align the excavations to follow existing parallel water pipeline in order to minimize the loss of vegetation cover;
- In areas of dense vegetation cover, the removal of vegetation must be restricted to the minimum necessary width;
- Unbury and replant slow growing large to nearly cleared areas away from pipeline route.

7.7.6 Loss of vegetation

i) Description of the impact: Excavation activities to construct project components and bury the water pipeline require the removal of vegetation. This activity will lead to a loss of vegetation and open access to sites with intact vegetation. Moreover, once established the right of way for the water pipeline will be regularly cleared to control the growth of trees, whose roots may disrupt the pipe.

ii) Relevant phase: During operation and construction phases

Impact type and classification						
Direct	Negative	Long term	Site specific	Irreversible	Moderate	Definite

Mitigation measures

- Align the excavations to follow existing parallel water pipeline in order to minimize the loss of vegetation cover;
- In areas of dense vegetation cover, the removal of vegetation must be restricted to the minimum necessary width;
- Unbury and replant slow growing large to nearly cleared areas away from pipeline route.

7.7.7 River flow disturbance

i) Description of the impact: Due to construction project activities, Nyabarongo river flow may be disturbed due to temporary obstruction of part of the flow and with risks of disruption due to dumping of construction materials in the river and activities on the banks of the river.

ii) Relevant phase: During construction and decommissioning

Impact type and classification						
Direct	Negative	Short term	Site specific	Reversible	Low	Highly probable

Mitigation measures

- Avoid whenever possible working in the river and minimize water diversion
- Remove all wastes in the river which may disrupt its flow
- Carry out all possible activities far from the river banks

7.7.8 Pollution due to solid wastes

i) Description of the impact: Solid wastes from the construction activities and worker's domestic waste can also have negative impacts on the environment. These wastes include construction debris such as plastics, stones, sand, gravel, timber, iron bar and human wastes and food leftovers. Some of these waste can also be produced during operation and decommissioning period.

ii) Relevant phase: during construction, operation and decommissioning

Impact type and classification						
Direct	Negative	Short term	Site specific	Reversible	Low	Definite

Mitigation measures

Non-hazardous solid waste generated at construction and decommissioning sites includes excess fill materials from excavation activities, scrap wood and metals, and small concrete spills.

The excessive generation of inert construction material increases disposal costs and may take up valuable landfill space. With the implementation of good site management and careful planning, the over-ordering of materials and generation of inert construction and material should be minimized.

Hazardous solid waste includes contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil as well as spill cleanup materials from oil and fuel spills.

Measures for solid wastes management include:

(i) Waste Prevention:

- Instituting procurement measures that recognize opportunities to return usable materials such as containers and which prevents the over ordering of materials
- Minimizing hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed

(ii) Recycling and Reuse: In addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans. All the solid waste should be collected; the biodegradable organic material composted properly on site for manure production and the non-biodegradable disposed of in a public landfill.

A waste collection system will be in operation to handle solid wastes, oily rags, and used fuel and lube oil filters in a leak-proof container that will be stored and disposed off at the landfill site, to ensure effective management of solid wastes at the project site.

7.7.9 Surface water pollution

i) Description of the impact: The water supply project activities such as trenching and excavation activities might affect the quality of surface waters in the project zone, especially Nyabarongo river if proper mitigation measures are not enforced. In addition, if waste derived from water treatment works are not properly managed, water pollution of the nearest stream occurs.

ii) Relevant phase: during construction, operation and decommissioning

Impact type and classification						
Direct	Negative	Short term	Site specific	irreversible	Low	Definite

Mitigation measures

- Stockpiles from excavation should be minimize and protected from run off and rain especially during rainy season,
- Trenches and drainage should not direct water to nearby streams or rivers to avoid pollution.
- Trees should be planted and revegetation provided to avoid bare land which is prone to erosion.

7.7.13 Risks of injuries and accidents cause by Force Majeure

i) Description of the impact: For any project, it is very crucial to consider risks, accidents, damages that may be caused by force majeure during project implementation which may be due to natural disaster, environmental accident such as tornados, tsunamis or any unpredicted catastrophe.

ii) Relevant phase: during construction, operation and decommissioning

Impact type and classification						
Direct	Negative	Short / Long term	Regional	Irreversible	High	Possible

Mitigation measures

All reasonable precaution will be taken to prevent danger to the workers and the public from fire, flood, drowning, etc. Specifically, the contractor will (i) provide medical and accident insurance for workers; (ii) provide first aid in the construction camp site; and (iii) provide access to hospitals/clinics within the project site that can be accessed in case of emergency by arranging necessary transport for safe carriage of the injured.

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introductory description of the proposed ESMPs

The Environmental Management Plan (EMP) aims to make this project conform with the applicable environmental legal requirements and also to help all stakeholders to find their role and responsibility in the environmental preservation during the implementation of the present project.

This Environmental Management Plan completes the information given for the environmental impacts and the specific mitigation measures proposed in the previous sections. It proposes the institutional responsibilities for the implementation of the mitigation measures, the implementation indicators, the time frame for monitoring and follow-up and also the estimated cost for the implementation of various activities.

The Environmental and Social Management Plan (ESMP) described in Table 8.1 provides a way forward for implementation of the identified mitigation measures. The contractor shall be responsible for overall implementation of the ESMP. A project Environmental and Social Officer shall be designated to make day to day follow ups (e.g. supervision and liaising with stakeholders). The estimated costs for implementation of the mitigation measures are just indicative. Appropriate bills of quantities should clearly give actual figures. In any case the consultant used informed judgement to come up with these figures.

8-2 Roles and responsibilities of institutions in ESMP implementation

During implementation of ESMPs, different institutions/ parties in the project implementation will play their roles as follow:

- **WASAC:** As project implementing agency/ client, WASAC will be always conducting regular inspections to the project site to ensure all legal, regulatory, and policy provision that the project must comply with, are respected. WASAC is also responsible to engage other institutions with expertise in specific fields to ensure compliance in those field. WASAC is also responsible to closely collaborate with Local government entities in the Districts of the project area to ensure the smoth implementation of the project with the satisfaction of the population and other project affected persons or beneficiaries. WASAC is responsible to check and ensure that all the obligations of the contractor towards the local populations such as payments, compensations, etc related to the project execution are effectively performed.
- **The contractor** is responsible for the execution or works under the project. He is responsible for all workers engaged in the project and therefore, has to ensure all his workers adhere to the rules and regulations of the local administration in the project area, he has also to avail the workers in case there are sensitisation campaigns or meetings related to the implementation of the project. Has to ensure good working conditions (socially and economically among his workers), put in place occupational health and safety systems in working area complying with standards. The contractor is also responsible to put in place all mitigation measures to prevent/address the impacts likely to be caused/caused by the project execution and to ensure execution of the project is complying with all provisions of the legal, regulatory and policy framework.
- **The project supervisor:** Normally the project supervisor is working on behalf of the client on daily basis on the site of works. His responsibility is to ensure the execution of works in compliance with the technical and standards requirements of the working documents as well as the applicable codes of practice and to ensure and the compliance of the project execution to the legal, regulatory and policy framework in force. He has responsibility to take measures and mitigation actions after reporting and agreeing with WASAC on the cases of noncompliance.
- **Local authorities** are administrator of the administrative zones covered by the project area. Local government entities are responsible to ensure a good implementation of all the central level policies in relation to the administration, population welfare, protection of environment and natural resources, protection of infrastructures, etc. Therefore, any matters concerning the project implementation falling in the mandate of the local entities will be handled by them. The contractor and WASAC will work in close collaboration with local entities in matters regarding the access to lands, compensation of populations's properties, awareness compaigns for health related behaviours during project implementation/ neighbourhood and other necessary requirement. Local entities will inspect and ensure the execution of the project is not harming environment and natural resources, health and wealth of the population, etc.
- RDB has issued the EIA Certificate to the project in terms of readiness to comply with the provisions in protecting environment. REMA is responsible to inspect the compliance with the conditions of approval that have been attached to the EIA certificate.

Table: 8.1. Environmental and Social Management Plan (ESMP)

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
Preparatory phase						
• Local community • Contractor workers	Workforce recruitment	Risk of conflicts over discrimination, corruption and other conflicts during workforce recruitment	• Priority of employment is given to the local people • Compliance with national laws (workers with contracts, wages, no workers below the age of 16 years and no discriminations against women or other vulnerable). • Establish a Grievance Redress Mechanism	Contractor; Supervising firm; WASAC Districts Labor Inspectorate.	Before works start	n/a
		Potential risk of insecurity due to influx of job seekers.	• The contractor shall develop a Labour Influx Management Plan to manage influx of workers. • The above plan shall include awareness of the local population to inform them about the potential influx and how they should behave. • Establish a Grievance Redress Mechanism	Contractor; Supervising firm; WASAC Districts	Before works start	n/a

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
• Local community • Contractor workers	Installation of the project camp site and mobilisation materials and equipment.	Risk accidents during site installation, mobilization of materials and equipment will increase movement of vehicles, heavy trucks with high risk to induce accidents.	• There shall be risk assessment for all proposed campsites subject to approval by the client. • Campsite shall not be located in the very inhabited place especially those typical areas where we find with kids playing on road. • There shall be proper housekeeping measure to manage stock of materials. • The campsite shall be equipped with fire extinguisher and first aid arrangements • Fence the campsite and post site safety notice at the entrance and prevent any entrance of visitors • Speed limitation to 20 km/h for engine and trucks within the campsite. • Report any accident and apply corrective measures	Contractor; Supervising firm; WASAC	Before and during works	30,000,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
Animals, plants, and biodiversity	Earth and vegetation clearing during campsite installation	Damage to ecosystem habitat and biodiversity loss	• Safeguard protected plants and other plants where possible • Earth and vegetation clearing shall be limited to the minimum required space. • Restore the site and simulate the habitat, by re-planting indigenous tree species and plants.	Contractor; Supervising firm; WASAC; District through environmental protection office; REMA	During construction phase	22,000,000
• Land owners Local Community	Land acquisition processes.	Risks of conflicts related to loss of land or land acquisition. In this phase the land will be required to establish a project site (camp site)	• Fair compensation at full replacement cost of properties and lands to be based on the approved Resettlement Action Plan, AfDB Operational Safeguard 2 and the Expropriation Law in Rwanda; • Ensure participation of owners and local administration in all compensation process; • Establish the Grievance Redress Mechanism	Supervising firm; WASAC; District with its decentralised entities from village to sector	Before works start	481,758,865
Construction phase						

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
• Ecosystem Local community	Establishment of raw water intake facility	Impacts on water quality and subsequent ecosystems and habitat. The pollution shall be induced by works to establish water intake at the source increasing soil erosion and sedimentation.	Deviate water river when installing the water intake structure.	Contractor; Supervising firm; WASAC; RWB; REMA	During construction phase	200,000
		Modification of water flow and level by increasing the well field as water sources in the vicinity of Nyabarongo river, given that the groundwater is fed by the river. This modification will threaten normal use of water by local community in agriculture, households use,	Implement the recommended distance between each well with its neighbour one to avoid disruption of groundwater discharge pattern and the drying of some wells during raw water pumping. Conduct regular monitoring of the ground water recharge during the implementation of the project in order to well locate and construct each wells appropriately.	Contractor; Supervising firm; WASAC; RWB;	During construction phase	n/a

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
		animal feeding especially in the dry season, and will threaten also biodiversity that depends on water flow from those sources.				
• Biodiversity • Ecosystem	Earth and vegetation clearing during sites preparation (sites for water intake, pumping stations, water treatment plant, pipes laying, tanks, tec…)	Loss of habitat and biodiversity due to site clearance, removal of top vegetable soil, and site levelling	• Restore the site and simulate the habitat, by re-planting indigenous tree species and plants • Safeguard protected plants and other plants where possible	Contractor; Supervising firm; WASAC; District to ensure the excavated soils are appropriately managed	During construction phase	500,000
• Animals • Local Community • Workers	Trenches, foundation, borrow site excavation related works.	Risks of accidents of animals, people living near the project area, workers by falling in the	• Excavated trenches and pits shall be refilled immediately when the construction works is completed. • Excavated trenches and pits shall be protected by barricades or	Contractor; Supervising firm; WASAC;	During construction phase	1,800,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
		excavated pits, trenches.	other safety barriers during the time those trenches or pits can't be immediately refilled.			
• Local community • Workers • Road users	Laying of pipes along the proposed pipeline routes	Risk of road accidents as some of works will be completed on the proposed pipeline and well excavations/construction with high volume of traffic.	• There shall be a risk assessment for all works that will be completed near the asphalt road. • There shall be traffic management for all works that will be completed on the main road. • Involvement of the national police-traffic department.	Contractor; Supervising firm; WASAC;	During construction phase	n/a
• Soil • Water courses • Vegetation	Soil excavation at all sites (water intake, pumping stations, water treatment plant, pipes laying, tanks, tec…)	Risks of soil erosion: excavated soil if not remove can be eroded in the neighboring areas.	• Remove soil immediately after excavation and store it in designated place. • Construct soil stability structure around stored soil.	Contractor Supervising firm	During construction phase	200,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
• Workers • Local community	Construction of proposed WSS facilities (intake, water treatment plant, pipes, pumping stations, etc…)	Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	• Established effective medical emergency response plan • Ensure availed first aid kits and train workers on use. • Safety signs availed at the site • Personal protective equipment availed (Types and quantities) • Documented risk Assessment and its communication • Health and safety training program and filled training participation list	Contractor Supervising firm	During construction phase	6,000,000
• Road users	Activities requiring road deviation like pipes laying along the road and or across the road.	Disruption of road users' movement on the road due to road closer, deviation during pipes laying activities.	• The contractor will seek permission to RTDA when there is planned work that will disrupt the road use. • There shall be signage to indicate the nature of disruption and guide road users on the alternative routes. • There should be consultations in the planning phase on how the	WASAC, Districts of Nyaruguru, Huye and Gisagara Contractor Supervising firm	During construction phase	

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			traffic will be managed for all activities completed on road.			
• Soil • Water • Air	Generation of waste from construction activities (rest of paints, packaging)	Contamination of the soil, air and water by waste generated during construction works.	• Follow the 3 R (Reduce, Reuse, Recycle) hierarchy used in waste management. • Ensure proper mechanism to deal with spills (avail spill kits to contain oil and other chemical spill)	Contractor Supervising firm	During construction phase	500,000
• Workers • Local community	Labor influx-Recruitment and accommodating many people in one place from different provenance.	Risk of disease transmission between workers themselves, between workers and the local community (example of disease: HIV/AIDS, low hygiene related diseases)	• Measures to prevent poor hygiene and sanitation including availing hand washing and proper sanitary facilities. • Sensitize about prevention of HIV/AIDS and sexually transmitted diseases. • Provide condoms in some places like toilets • Recruit among local workforce so they can work and return at their home.	WASAC Ministry of Health Contractor Supervising firm	During construction phase	3,000,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			• Workers required to register to the mutuelle de santé.			
• Workers	Human resources management related activities	Risk of delay or non-payment of casual labors	• District will closely supervise timely payment of labor by the contractor, • In case the contractor does not pay labor, the District shall hold his pending payment. • The District should also request the contractor to provide an assurance covering this kind of issues. • Strictly follow the labor law	Contractor; Supervising firm; WASAC; District through the local entities and the labour inspectorate office;	During construction phase	n/a
• Local community • Workers	Construction activities (excavation, elevations, installation of pumps and other equipment, blasting, etc…)	Disturbance of the neighbouring habitations due to noise, dust and vibration	• Use less heavy machinery that emits less gases and noise. • Early engagement and awareness raising to the community about construction activities • Provide personal protective equipment like dust mask and ear muffs.	Contractor; Supervising firm; WASAC; RWB;	During construction phase	600,000 Rwf

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			• Work hours limited to the day working period (7h00 am to 5h00 pm)			
			Operational phase			
• Biodiversity • Local communities	Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the neighbourhood may reduce	• Appropriate, effective and efficient compensation should be undertaken in compliance with the law and to the satisfaction of the affected persons. • The project developer should make buffer zone to each well-constructed to avoid conflicts between well developments and the plantations • Every water user should respect his water abstraction level and seek water abstraction license from the RWB before any activity is undertaken.	WASAC, Districts; WTP Operator	During operational phase	n/a
		Impacts on water quantity and quality, hydrological pattern	• WASAC shall ensure that water abstracted from Nyabarongo river shall not compromise water	WASAC, contractor Supervision firm	During operational phase	n/a

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
		of Nyabarongo river, etc	quality, quantity, and hydrological pattern required for the survival of ecosystems.			
• Soil • Water • Local community	Water treatment activities	Impacts related to management of sludge (bad smell, water & soil contamination)	• Establish sludge aerobic stabilization site which allows the reduction of odors, pathogens, the presence of viable seeds and shall prevent pollution to environment. • The stabilized sludge shall be composted and used as soil amendment.	WASAC; WTP Operator	During operational phase	35,000,000
• Soil • Water • Local community	WSS maintenance operations	Risk of water leakage from broken pipes causing water and soil erosion.	• Avail a team of trained technicians ready for repair at any time the pipes break • Use strong pipes during construction • Establish a water leakage reporting channel and communicate it to the people living near the WSS network	WASAC; WSS Operators	During operational phase	Maintenance and operational costs

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			• Conduct awareness among the population in that area and ask them to communicate any water leakage they may notice.			
• Local community	WSS maintenance operations	Conflict may arise over insufficient water distributed and people may fight for the small quantities available inducing them into crimes.	• Awareness on efficient use of natural resources available. • Ensure continual supply of water and establishment of as many as possible community water points.	WASAC, Districts	During operational phase	Maintenance and operational costs
• WSS system • Workers • Local community • Environment	WSS maintenance operations	Risk of fire outbreak during the operations of the WSS especially at the water treatment facility	• The water treatment plant shall be equipped with fire extinguisher and first aid arrangements • Workers shall be trained how to use fire extinguishing system. • A fire marshal team shall be established and trained to prevent and/or stop fire.	WASAC, WSS Operator	During operational phase	4,000,000
• Soil • Water • Air	WSS operations	Contamination of the soil, air and water by waste generated during operations of the WSS.	• Follow the 3 R (Reduce, Reuse, Recycle) hierarchy used in waste management.	WSS Operator	During operational phase	n/a

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			• Separate waste from the source and ensure hazardous waste are properly disposed off.			
• Climate	Use of non-renewable energy source.	Risk of increased greenhouse gas (GHG) emissions and amplified vulnerability to climate change.	• Use renewable source of energy where applicable. • Encourage the use of machinery and equipment with low emissions of GHG.	WASAC, WSS Operator	During operational phase	n/a
Decommissioning phase						
• Soil • Water Local community	Demolition and removal of debris from the WSS facilities	Soil and water pollution (surface and ground water) due to construction waste generation	• Follow the 3 R (Recover, Reuse, Recycle) hierarchy used in waste management. • All materials from demolition shall be recovered for reuse. • Non-reusable and non-recyclable materials shall be disposed in environmental approved manner.	WASAC, Contractor, Supervising firm.	Decommissioning phase	n/a
• Air Local community	Demolition activities.	Pollution to the ambient air affecting the air quality due to particulate matters that shall be released in the	• Regularly spread of water on the site during demolition works.	WASAC, Contractor, Supervising firm.	Decommissioning phase	8,000,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
		atmosphere from demolition activities.	• Manual demolishing to increase the quantity of materials recovered for reuse.			
• Local community • Wildlife animals	Demolition activities.	Increase of noise levels	• The works shall be scheduled between 7 a.m and 5 pm to avoid noise during night. • Preferably adopt labor intensive (manual) demolishing to avoid noise by machinery. • Ensure good maintenance of machinery.	Contractor, Supervising firm.	Decommissioning phase	n/a
• Workers • Local communities	Demolition activities.	Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	• Documented risk Assessment and its communication • Established effective medical emergency response plan • Ensure availed first aid kits and train workers on use. • Safety signs availed at the site • Personal protective equipment availed (Types and quantities)	Contractor, Supervising firm	Decommissioning phase	6,500,000

Impact's receptor	Activity	Negative Impacts	Proposed mitigation measures	Responsible party	Timeline	Cost (Rwf)
			• Health and safety training program and filled training participation list			
					Total ESMP budget	600,058,865

CHAPTER 9: ENVIRONMENTAL MONITORING PLAN

Monitoring refers to the systematic collection of data through a series of repetitive measurements over a long period of time to provide information on characteristics and functioning of environmental and social variables in specific areas over time.

Environmental monitoring is an essential component of project implementation. A general monitoring plan should be implemented on site. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measures. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. In this chapter a monitoring plan is proposed and is provided in **Table 9.1** below.

Table 9.1: Environmental and Social Monitoring Plan

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Preparatory phase							
Local community Contractor workers	Risk of conflicts over discrimination, corruption and other conflicts during workforce recruitment	Priority of employment is given to the local people	Verification of the number of local households employed in the project.	Number of households with a member hired	Weekly	Contractor; WASAC; Supervising firm; District labour inspectorate	n/a
		Compliance with national laws (workers with contracts, wages, no workers below the age of 16 years and no discriminations against women or other vulnerable).	Request IDs of job seekers before contracting or engaging them in the work.	Identity cards of workers	Daily	Contractor; WASAC; Supervising firm; District labour inspectorate	Contractual budget

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
		Establish a Grievance Redress Mechanism	Verification of the GRCs operations and reports.	Number of established GRC	Weekly	Contractor. Supervising firm. WASAC Government local entities at village, cell, sector and District level	n/a
	Potential risk of insecurity due to influx of job seekers.	The contractor shall develop and implement a Labour Influx Management Plan which include awareness of the local population to manage influx of workers.	Verification of the availability and implementation of an approved Labor Influx Management plan	Labor Influx Management plan and implementation report	Before starting of the recruitment and on monthly basis	Contractor. Supervising firm. WASAC; Local entities	Contractual budget
		Establish a Grievance Redress Mechanism	Verification of the GRCs operations and reports.	Number of established GRC	Weekly	Contractor. Supervising firm. WASAC; Local entities	n/a
Local community Contractor workers	Risk accidents during site installation, mobilization of materials and equipment will increase	There shall be risk assessment for all proposed campsites subject to approval by the client.	Verification of availability of the risk assessment report	Risk assesment report	Once before works and every time a new work is proposed	Contractor. Supervising firm. WASAC	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
	movement of vehicles, heavy trucks with high risk to induce accidents.	Campsite shall not be located in the very inhabited place especially those typical area where we find with kids playing on road.	Verification of the location of the campsite.	Location of the camp-site	Once before starting the works	Contractor. Supervising firm. WASAC	n/a
		There shall be proper housekeeping plan to manage stock of materials.	Verification of the availability and implementation of an approved proper housekeeping plan	proper housekeeping plan and implementation report	Before starting of works and on monthly basis	Contractor. Supervising firm. WASAC	Contractual budget
		Provide Personal Protective Equipment (PPEs) to all workers (e.g., helmets, dust masks, gloves, safety glasses, boots, and high visibility jackets).	Counting of workers with PPEs at the site.	Number of PPEs	Daily	Contractor. Supervising firm.	Contractual budget
		The campsite shall be equipped with fire extinguisher and first aid arrangements	Counting the number of first aid kit provided	Number of first-aid kits	Daily	Contractor	Contractual budget

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
		Fence the campsite and post site safety notice at the entrance and prevent any entrance of visitors	Verification of the campsite fence	Constructed fence	End of campsite construction	Contractor	Contractual budget
		Avail tout-risque chantier insurance covering the entire construction site.	Verification of the insurance document.	Copy of insurance	Daily	Contractor	Contractual budget
		Ensure that all workers have medical insurance.	Verification of medical insurance documents.	Copy of medical insurance	Daily	Contractor. Supervising firm.	Covered by workers
Animals, plants, and biodiversity	Damage to ecosystem habitat and biodiversity loss	Safeguard protected plants and other plants where possible	Counting the number of protected plants	Number of protected plant	Before starting of works and every 6 months	Contractor. Supervising firm. WASAC; REMA; District Environmental office	Contractual budget
		Earth and vegetation clearing shall be limited to the minimum required space.	Measuring the surface of cleared area	Surface of cleared area	Monthly	Contractor. Supervising firm.	Contractual budget

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
		Restore the site and simulate the habitat, by re-planting indigenous tree species and plants.	Measuring the surface of the restored area	Surface of restored area	After construction works.	Contractor. Supervising firm.	Contractual budget
Land owners Local Community	Risks of conflicts related to loss of land or land acquisition. In this phase the land will be required to establish a project site (camp site)	Fair compensation at full replacement cost of properties and lands to be based on the approved Resettlement Action Plan, AfDB Operational Safeguard 2 and the Expropriation Law in Rwanda;	Verification of the approved RAP report and its implementation monitoring reports.	Report of RAP implementation	Monthly	Contractor. Supervising firm. WASAC.	n/a
		Ensure participation of owners and local administration in all compensation process;	Verification of public consultation report	Public consultation report	Before starting of works.	Contractor. Supervising firm. WASAC; Local Government entities	n/a
		Establish the Grievance Redress Mechanism	Verification of the GRCs operations and reports.	Number of established GRC	Weekly	Contractor. Supervising firm. WASAC; Local Government entities	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Construction phase							
Ecosystem Local community	Impacts on water quality and subsequent ecosystems and habitat. The pollution shall be induced by works to establish water intake at the source increasing soil erosion and sedimentation.	Deviate water river when installing the water intake structure.	Verification of the implementation of water deviation measure	Water quality monitoring report	Monthly	Contractor. Supervising firm. WASAC; District environment office; REMA; RWB	400,000
	Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the neighbourhood may reduce	• Appropriate, effective and efficient compensation should be undertaken in compliance with the law and to the satisfaction	Volume of water withdrawn. Volume of the total water flowing in the river.	Monthly	Contractor. Supervising firm. WASAC	150,000

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			of the affected persons. • The project developer should make buffer zone to each well-constructed to avoid conflicts between well developments and the plantations Every water user should respect his water abstraction level and seek				

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			water abstraction license from the RWB before any activity is undertaken.				
Biodiversity Ecosystem	Loss of habitat and biodiversity due to site clearance, removal of top vegetable soil, and site leveling	Restore the site and simulate the habitat, by re-planting indigenous tree species and plants	Measure the restored surface	Restored surface	After completion of construction works.	Contractor. Supervising firm. WASAC	n/a
		Safeguard protected plants and other plants where possible	Counting the number of protected plants	Number of protected plant	Before starting of works and every 6 months	Contractor. Supervising firm. District environmental office; REMA	n/a
Animals Local Community Workers	Risks of accidents of animals, people living near the project area, workers by falling in the excavated pits, trenches.	Excavated trenches and pits shall be refilled immediately when the construction works is completed	Verification of trenches refilling	The length of refilled trenches vs those not refilled	Daily basis	Contractor. Supervising firm.	n/a
		Excavated trenches and pits shall be protected by barricades or other safety barriers during the time those trenches or pits can't be immediately refilled.	Verification of the protected trenches	The length of the protected trenches	Daily basis	Contractor. Supervising firm.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Local community Workers Road users	Risk of road accidents as some of works will be completed on the main road to be crossed by the projects works	There shall be a risk assessment for all works that will be completed near the asphalt road.	Verification of availability of the risk assessment report	Risk assesment report	Once before works and every time a new work is proposed	Contractor. Supervising firm. WASAC	n/a
		There shall be traffic management for all works that will be completed on the main road.	Verification of availability of the traffic management plan and its implementation report.	Traffic management plan and its implementation report	Once before works and monthly basis	Contractor. Supervising firm. WASAC	n/a
Soil Water courses Vegetation	Risks of soil erosion: excavated soil if not remove can be eroded in the neighbouring areas.	Remove soil immediately after excavation and store it in designated place.	Measuring the quantity of spoil removed and disposed in environmental approved manner	Quantity of spoil disposed in environmental approved manner	Daily	Contractor. Supervising firm.	n/a
		Construct soil stability structure around stored soil.	Measuring the quantity of spoil stability structure established	Quantity of spoil stability structure	Daily	Contractor. Supervising firm.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Workers Local community	Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	Established effective medical emergency response plan	Verification of availability of the medical emergency response plan and its implementation report.	Medical emergency response plan and its implementation report	Once before works and monthly basis	Contractor. Supervising firm. WASAC	n/a
		Ensure availed first aid kits.	Counting the number of first aid kit provided	Number of first-aid kits	Daily	Contractor; Supervising firm.	n/a
		Safety signs availed at the site	Counting the number of safety signs provided	Number of safety signs	Daily	Contractor; Supervising firm.	n/a
		Personal protective equipment availed (Types and quantities)	Counting of workers with PPEs at the site.	Number of PPEs	Daily	Contractor. Supervising firm.	n/a
		Documented risk Assessment and its communication	Verification of availability of the risk assessment report	Risk assesment report	Once before works and every time a new work is proposed	Contractor. Supervising firm. WASAC	n/a
		Health and safety training program and filled training participation list	Verification of the number of health and safety training	Number of health and safety	Monthly	Contractor. Supervising firm. WASAC	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			sessions and participation lists	training sessions			
Road users	Disruption of road users' movement on the road due to road closer, deviation during pipes laying activities.	The contractor will seek permission to RTDA when there is planned work that will disrupt the road use.	Verifying the permits for work with potential to disrupt the use of the road	Permits	Every time there is work to be completed on the asphalt road.	Contractor Supervising firm.	n/a
		There shall be signage to indicate the nature of disruption and guide road users on the alternative routes.	Verifying the presence of the road deviation signs	Road deviation signs and its use.	Every time there is work to be completed on the asphalt road.	Contractor Supervising firm.	n/a
		There should be consultations in the planning phase on how the traffic will be managed for all activities completed on road.	Verifying the consultations reports	Consultation report/meeting minutes.	Every time there is work to be completed on the asphalt road.	Contractor Supervising firm.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Soil Water Air	Contamination of the soil, air and water by waste generated during construction works.	Follow the 3 R (Reduce, Reuse, Recycle) hierarchy used in waste management.	Measuring the volume of waste reused, sent to recycling, disposed.	Volume of waste reused, sent to recycling, disposed	Weekly	Contractor Supervising firm.	n/a
		Ensure proper mechanism to deal with spills (avail spill kits to contain oil and other chemical spill)	Counting spill kits and checking its use.	Number spill kits available. Spill kits use report	Weekly	Contractor Supervising firm.	n/a
Workers Local community	Risk of disease transmission between workers themselves, between workers and the local community (example of disease: HIV/AIDS, low hygiene related diseases)	Measures to prevent poor hygiene and sanitation including availing hand washing and proper sanitary facilities.	Counting the number of hygiene and sanitation facilities provided	Number of hygiene and sanitation facilities provided	Monthly	Contractor Supervising firm. Local government entities	n/a
		Sensitize about prevention of HIV/AIDS and sexually transmitted diseases.	Counting the number of sensitization session held and number of participants	Number of sensitization session held and number of participants	Quarterly	Contractor Supervising firm. Local government entities	n/a
		Provide condoms in some places like toilets	Verify records of the quantities of condoms distributed	Number of condoms distribution sessions	Monthly	Contractor. Supervising firm.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
		Recruit among local workforce so they can work and return at their home.	Counting the number of local workforces hired.	Number of local workforces hired.	Monthly	Contractor. Supervising firm.	n/a
		Workers required to register to the mutuelle de santé.	Counting the number of workers with health insurance	Number of workers with health insurance	Monthly	Contractor. Supervising firm.	n/a
Workers	Risk of delay or non-payment of casual labors	District will closely supervise timely payment of labor by the contractor,	Verifying payment report	Payment report	Monthly	Contractor. Supervising firm.	n/a
		In case the contractor does not pay labor, the District shall hold his pending payment.	Verifying report of held contractor payments	Report of held contractor payments	When there are cases of workers payment delays	WASAC, Contractor. Supervising firm. Districts	n/a
		WASAC should also request the contractor to provide an insurance covering this kind of issues.	Verifying the insurance for project completion	Insurance for project completion	Before starting of works	WASAC Contractor. Supervising firm. Districts	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Local community Workers	Disturbance of the neighboring habitations due to noise, dust and vibration	Use of well-maintained and less heavy machinery that emits less gases and noise.	Checking the validity of technical control of machinery.	Valid technical control of machinery.	Every 6 months	Contractor. Supervising firm.	n/a
		Early engagement and awareness raising to the community about construction activities	Counting the number of awareness and engagement sessions/participation.	Number of awareness and engagement sessions/participation	Monthly	Contractor. Supervising firm.	n/a
		Provide personal protective equipment like dust mask and ear muffs.	Counting the number of PPEs provided	number of PPEs provided	Monthly	Contractor. Supervising firm.	n/a
		Work hours limited to the day working period (7h00 am to 5h00 pm)	Verifying the working hours report	working hours report	Monthly	Contractor. Supervising firm.	n/a
Operational phase							
Biodiversity Local communities	Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the	• Appropriate, effective and efficient compensation should be undertaken in	Water abstraction permit by competent authority	Before starting the abstraction operations	WASAC WSS Operator.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
		neighbourhood may reduce	compliance with the law and to the satisfaction of the affected persons. • The project developer should make buffer zone to each well-constructed to avoid conflicts between well developments and the plantations Every water user should				

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			respect his water abstraction level and seek water abstraction license from the RWB before any activity is undertaken.				
	Water withdrawal from the well field to be developed in the marshland along Nyabarongo river.	Conflicts from different users of marshland along Nyabarongo river arising from water abstraction competition where some of the plantations have to be replaced by wells development and likely water for plants in the neighbourhood may reduce	• Appropriate, effective and efficient compensation should be undertaken in compliance with the law and to the satisfaction of the	Water quality and quantity downstream of the intake site	Quarterly	WASAC WSS Operator.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			affected persons. • The project developer should make buffer zone to each well-constructed to avoid conflicts between well developments and the plantations Every water user should respect his water abstraction level and seek water abstraction				

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			license from the RWB before any activity is undertaken.				
Soil Water Local community	Impacts related to management of sludge (bad smell, water & soil contamination)	Establish sludge aerobic stabilization site which allows the reduction of odors, pathogens, the presence of viable seeds and shall prevent pollution to environment. The stabilized sludge shall be composted and used as soil amendment.	Verification of the establishment of sludge aerobic stabilization site and the volume treated at the site	Presence of sludge aerobic stabilization and the volume of the treated sludge.	Monthly	WASAC WTP Operator.	n/a
Soil Water Local community	Risk of water leakage from broken pipes causing water and soil erosion.	Avail a team of trained technicians ready for repair at any time the pipes break	Verification of the technical team mobilization	Number of technicians mobilised	Monthly	WASAC WSS Operator.	n/a
		Establish a water leakage reporting channel and communicate it to the people living near the WSS network	Verifying the water leakage report system	Documented water leakage reporting system	Before starting of operational phase.	WASAC WSS Operator.	n/a
		Conduct awareness among the population in that area and ask them to communicate any water leakage they may notice.	Verifying the number of awareness sessions and participation	Number of awareness sessions and participation	Quarterly	WASAC WSS Operator.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Local community	Conflict may arise over insufficient water distributed and people may fight for the small quantities available inducing them into crimes.	Awareness on efficient use of natural resources available.	Verifying the number of awareness sessions and participation	Number of awareness sessions and participation	Quarterly	WASAC WSS Operator.	n/a
		Ensure continual supply of water and establishment of as many as possible community water points.	Measuring the quantity of water supplied.	Quantity of water supplied	Daily	WASAC WSS Operator.	n/a
WSS system Workers Local community Environment	Risk of fire outbreak during the operations of the WSS especially at the water treatment facility	The water treatment plant shall be equipped with fire extinguisher and first aid arrangement	Checking the number of fire extinguisher and service expiration dates	Number of fire extinguisher and valid service expiration dates	Monthly	WASAC WSS Operator.	n/a
		Workers shall be trained how to use fire extinguishing system.	Verification of the number of training sessions/participation	Number of training sessions/participation	Monthly	WASAC WSS Operator.	n/a
		A fire marshal team shall be established and trained to prevent and/or stop fire.	Verification of the establishment of the fire marshal team	List of trained fire marshal team	Quarterly	WASAC WSS Operator.	n/a
Soil Water	Contamination of the soil, air and	Follow the 3 R (Reduce, Reuse, Recycle) hierarchy	Measuring the volume of	Volume of waste	Monthly	WASAC	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Air	water by waste generated during operations of the WSS.	used in waste management. Separate waste from the source and ensure hazardous waste are properly disposed off.	waste recovered for reuse, recycling and disposal	recovered for reuse, recycling and disposal		WSS Operator.	
Climate	Risk of increased greenhouse gas (GHG) emissions and amplified vulnerability to climate change.	Use renewable source of energy where applicable. Encourage the use of machinery and equipment with low emissions of GHG.	Checking/counting the sources of renewable energy used in the WSS	Quantity of renewable energy used in the WSS	Monthly	WASAC WSS Operator.	n/a
Decommissioning phase							
Soil Water Local community	Soil and water pollution (surface and ground water) due to construction waste generation	Follow the 3 R (Recover, Reuse, Recycle) hierarchy used in waste management.	Measuring the volume of waste recovered for reuse and recycling	Volume of waste recovered for reuse, and recycling	Monthly	WASAC Demolition contractor.	n/a
		Non-reusable and non-recyclable materials shall be disposed in environmental approved manner.	Measuring the volume of waste disposed through environmental approved manner.	Volume of waste waste disposed through environmental approved manner.	Monthly	WASAC Demolition contractor.	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Air Local community	Pollution to the ambient air affecting the air quality due to particulate matters that shall be released in the atmosphere from demolition activities.	Regularly spread of water on the site during demolition works.	Checking the volume of water spread on demolition sites	volume of water spread on demolition sites	Daily	Demolition contractor	n/a
		Manual demolishing to increase the quantity of materials recovered for reuse.	Verifying the volume of demolition completed manually.	Volume of demolition completed manually	Daily	Demolition contractor	n/a
Local community Wildlife animals	Increase of noise levels	The works shall be scheduled between 7 a.m and 5 pm to avoid noise during night.	Verification of the work schedules	Work schedule (7 am to 5 pm)	Daily	Demolition contractor	n/a
		Preferably adopt labor intensive (manual) demolishing to avoid noise by machinery.	Verifying the volume of demolition completed manually.	Volume of demolition completed manually	Daily	Demolition contractor	n/a
		Ensure good maintenance of machinery.	Verifying machinery technical control certificates	Validity of technical control certificates	Every 6 months	WASAC Demolition contractor	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
Workers Local communities	Risk of health injuries and accidents at work (falling, hit by flying or falling objects, hit by reversing vehicle, cuts, etc…)	Documented risk Assessment and its communication	Verification of availability of the risk assessment report	Risk assesment report	Once before works and every time a new work is proposed	Demolition contractor WASAC	n/a
		Established effective medical emergency response plan	Verification of availability of the medical emergency response plan and its implementation report.	Medical emergency response plan and its implementation report	Once before works and monthly basis	Demolition contractor WASAC	n/a
		Ensure availed first aid kits and train workers on use.	Counting the number of first aid kit provided	Number of first-aid kits	Daily	Demolition contractor	n/a
		Safety signs availed at the site	Counting the number of safety signs provided	Number of safety signs	Daily	Demolition contractor	n/a
		Personal protective equipment availed (Types and quantities)	Counting of workers with PPEs at the site.	Number of PPEs	Daily	Demolition contractor	n/a
		Health and safety training program and filled training participation list	Verification of the number of health and safety training	Number of health and safety	Monthly	Demolition contractor	n/a

Impact's receptor	Negative Impacts	Proposed mitigation measures	Monitoring			Responsible	Cost (Rwf)
			Methodology	Indicator	Frequency		
			sessions and participation lists	training sessions			

CHAPTER 10: CONTIGENCY PLAN

10.1 SPILLS

10.1.1 Petroleum/Gasoline spills

Petroleum/Gasoline may be stored on-site for use by machinery and vehicles during construction. Petrol/gasoline spill is:

a) Highly flammable
b) Explosive when in vapour foam
c) Easily ignited by flame or spark; lighter than water (floats on water)
d) Toxic to humans by ingestion
e) Toxic to aquatic organisms

The initial response to petrol/gasoline spill will be:

a) Stopping the flow at the source if possible.
b) Eliminating all possible sources of ignition (e.g. extinguish cigarette, shut off motors, generators)
c) Evacuating danger area
d) Carefully considering the hazards and merits of trying to contain the spill if it is safe to do so and obvious benefits of containment is apparent (e.g. contain if flowing towards a water course.) otherwise leave gasoline to spread and evaporate
e) Meeting at the emergency assembly point
f) Notifying the Supervising consultant.

In the event of fire, the response will be:

a) Using CO_2, dry chemical, foam or water spray (fog);
b) Using jet streams to wash away burning gasoline.
c) Diverting the gasoline to an open area and let it burn under control.
d) Using water to cool the tank surfaces.
e) Being aware of re-ignition if the fire is put out before all the gasoline is consumed.

Petrol/gasoline can be recovered in the following manner:

a) Unburnt gasoline can be soaked up by sand or pit moss or by commercial sorbets.
b) If necessary, contaminated soil will be excavated,
c) Gasoline entering the ground can be recovered digging sumps or trenches and pumping from below water table.
d) Petrol/ gasoline can be disposed of in the following manner.
e) Evaporation incineration under controlled manner.

10.1.2 Other Fuels and Oil Products

Fuel and Oil products spills will be contained using local earth material and /or sand bags. Spill clean-up equipment specifically designed for other fuel and Oil products are to be located at the

construction camp areas and at other detached storages. Dangers associated with fuel oil spills include:

a) Risks associated with flammability.
b) Mildly toxic by ingestion, highly toxic if aspirated.
c) Moderately toxic to aquatic organisms.
d) Harmful to waterfowl
e) Floats on water.

Spills or leaks of all light and medium oils, including fuel oil at storage facilities will be responded to by the following steps:

a) Identifying the source of the leak or spill
b) Stopping flow if possible
c) Eliminating open flame ignition processes.
d) Containing the spill.
e) Notifying the Supervisor's Representatives
f) Initiating Spill Response Plan.

Spilled diesel fuel can be covered by commercial sorbents or by sand straw or peat moss. If necessary, contaminated soil will be excavated. Digging sumps or trenches and pumping from below water table can recover diesel fuel saturated soil. Fuel spills on land will be responded to by the following procedures:

a) Construction of earth berm down slope of the running or seeping fluid.
b) Plastic taps may be placed at the base of the berm to allow the fuel pool on the plastic tarp for easy capture with absorbent pads,
c) Pads may be squeezed into empty drums and re-used.
d) Larger pools may be pumped back into the drums.
e) Special care will be taken to prevent the fuel from entering the water body or water where it will have greater negative impact.
f) Contaminated soil and vegetation may have to be removed and disposed off at well designated dump site in each district.

Fire Response methods for Diesel Fuel includes:

a) CO_2, dry chemical, form, or water spray.
b) Water to cool tank surface.
c) Diversion of the diesel to an open area and let it burn of under control.
d) Awareness of re-ignition if the fire is put before all diesel fuel is consumed

Fuel spills on water will be contained immediately to restrict the extent of the floating fuel. The methods, which may be used to contain the fuel include:

a) Booms deployed to contain the spill.
b) Absorbent pads used to capture small spills on watercourse.
c) A skimmer to recover oil contained by boom and then pumps the recovered fuel into empty fuel drums.

10.1.3 Acid Spills

These occur mainly from vehicle batteries and other materials with acidic chemical properties. Spills of acid will be contained using sand bags and neutralization can be accomplished using either soda ash or lime. Both the sand bags and lime will be stored at equipment maintenance yards'/service areas. Following neutralization, the area will be carefully flushed with water. Any water used for flushing a spill shall be contained, recovered and disposed of in an approved manner.

10.2 CONCRETE

During any course of concrete pour in the storm water pathways but mainly in the water courses, carbon-dioxide cylinders will be ready for use to neutralize the effect of the concrete.

10.1.3 Plan Review and Training

The Spill Contingency and Response Plan will be reviewed periodically by the Supervising consultant, Environmental officer (Contractors side), the Contractor's Project Manager and the District Environmentalist. Reviews will include updates to the products on site, suggested amendments to the plan, and reviews of handling and spill mitigation measures and other relevant information. The Spill Contingency and Response Plan will be a key component of Environmental Awareness Training Programs. All personnel on site will receive induction training in the use of the plan, prevention, expected reporting of spills, reporting structure, response, and follow-up.

CHAPTER 11: COMMUNITY HEALTH, SAFETY AND SECURITY MANAGEMENT PLAN

This plan provides potential community health, safety and a security risk associated with the implementation of the rehabilitation of Nzove 1 water treatment plan and water distribution network in Kigali and helps to provide guidance that respond and mitigate the identified risks. Under this plan all applicable laws and standards stated in legal and institutional framework shall apply. The table below shows the potential risks of the water supply project activities, the proposed mitigation measures and the responsibilities. The table below summarizes the Community Health, Safety and Security Management Plan.

Table: 11.1. Summary of Community Health, Safety & Security Management Plan

Potential Risk	Mitigation Measures	Responsible
Increased pressure on health services and infrastructure. The influx of new workers from outside areas to the project area will increase demand on existing health services	Health services of the new workers shall be provided especially the medical insurance "Mutuelle de santé" and where possible, the contractor may assist with the improvement of healthcare infrastructure.	Contractor Community Liaison and Health Officer WASAC
Spread of Communicable diseases. The influx of new workers to the area could bring with it an increase of communicable diseases, HIV/Aids, STD and `Covid 19.	Awareness campaigns on hygiene and sanitation and how these diseases spread and how to avoid the contaminations.	Contractor Community Liaison and Health Officer WASAC
Dust from transport and vehicles and machineries on roads	○ Control speed limits; ○ Haul truck transporting volatile construction materials ○ Ensure haul trucks are not overloaded and are covered where necessary; ○ Control of moisture content on haul road via sprinkling; Monitoring to ensure all dust emission are within national and international best practice limits.	Contractor WASAC
Increased road accidents	○ Control speed limits; ○ Ensure haul trucks are not overloaded and are covered where necessary; ○ Erect speed control signs ○ Community awareness	Contractor WASAC Traffic Police

Potential Risk	Mitigation Measures	Responsible
	○ All measures are written in separate Traffic Management Plan	
Diffuse run-off from roads, construction areas and other disturbed areas may contain elevated concentrations of suspended solids or pollutants.	○ Ditches will channel surface water runoff to the designated areas ○ Maximum reuse or recycle of process waste water; ○ Water monitoring will be conducted.	Contractor WASAC
Noise will be significant during construction.	○ Operating hours of the open pit activities only during the daily hours; ○ Speed restrictions on site traffic; and ○ Workers provided with PPE.	Contractor WASAC
Potential Economic impact on household livelihoods	○ Local residents will be hired where possible ○ Implementation of a livelihood restoration programme in the District	Contractor WASAC District authorities
Loss of properties due to project activities	○ Ensure compensation is carried out as per the expropriation Law ○ All compensations should be paid prior to commencement of works	Contractor WASAC Community Liaison and Health Officer
Gas emissions from project vehicles, trucks and construction machineries	○ Constant preventive emission control; ○ Ensure all project vehicles and trucks have valid vehicle inspection certificates, ○ Good design of plant and use of modern machineries and plant; ○ Air quality monitoring.	Contractor WASAC District environmentalist
Dust from construction activities including quarries and borrow pits	○ Open pit engineering design to ensure less dust escapes and is captured in the void; ○ Consider the meteorological conditions; ○ Water sprays on excavators,	Contractor WASAC

Potential Risk	Mitigation Measures	Responsible
	○ Workers provided with appropriate PPE.	

CHAPTER 12: TRAFFIC MANAGEMENT PLAN

12.1 TRAFFIC ISSUES AND PROBLEMS

The following issues related to traffic can be identified:

Lack of traffic discipline

a. Trucks or construction machineries stop near intersections and in all lanes just in front of intersection without any consideration of traffic flow or stop in the middle of the road,
b. Trucks and construction machineries drive at high speed in the project area and can cause serious accidents,
c. Vehicles stop near intersections and in all lanes just in front of intersection without any consideration of traffic flow or stop in the middle of the road to pick up and/or drop passengers,
d. Motorized vehicles are parked along roads, even if parking is forbidden.

Poor pedestrian facilities and behaviour

a. Pedestrians walk on the roadway because sidewalks are being upgraded, closed or occupied by unauthorized parking,
b. Pedestrians cross the road under construction everywhere and any time even if trucks, construction machineries or vehicle are passing through.
c. In roundabouts, pedestrians are waking anywhere and anytime when they want.

Poor Traffic Operation

a. The flag-person directs traffic against traffic/safety signals,
b. The flag-person uses sign posts which are not visible at distance or during darkness periods to direct traffic.
c. Many obstructions such as construction materials, construction equipment, and construction wastes are occupied in road spaces.

Poor Traffic Management Facilities

a. Road markings are non-existent or out of paint and lanes are not marked on the roadway,
b. Very few or poorly made road signs are installed on the road corridor and junctions,

Poor Traffic Signals

a. No truck, construction machineries and vehicle drivers follow traffic signal,
b. Some of the traffic signals are malfunctioning.

Poor Compliance for Drivers

Most people do not follow traffic rules properly because most drivers are not well-trained or are reluctant to abide by the traffic rules. Table below proposes counter measures for the traffic issues.

Tab: 12.1. Traffic Issues and Counter Measures

PROBLEM	CAUSE	COUNTERMEASURE	RESPONSIBLE
o Lack of traffic discipline	o Trucks or construction machineries stop near intersections	o All trucks and machineries should not stop near intersection	o Contractor o Health and safety officer o Flag-person
	o Trucks and construction machineries drive at high speed	o Speed limit sign posts should be installed and a flag-person to ensure compliance	o Contractor o Health and safety officer o Flag-person
	o Vehicles and construction machineries stop in the middle of the road	o Vehicle should be prohibited to stop in the middle of road when not at duty	o Contractor o Health and safety officer o Flag-person
	o Motorized vehicles are parked along roads	o A parking should be provided	o Contractor o Health and safety officer o Flag-person
o Poor pedestrian facilities and behavior	o Pedestrians walk on the roadway	o Ensure sidewalks are not occupied by unauthorized parking	o Contractor o Health and safety officer o Flag-person
	o Pedestrians cross the road under construction everywhere and any time even	o Pedestrians should be guided when crossing the road under construction	o Contractor o Health and safety officer o Flag-person
	o Pedestrians are waking in roundabouts, anywhere and anytime when they want	o Pedestrian should be stopped from walking in the round or guided when construction activities are being carried out	o Contractor o Health and safety officer o Flag-person
o Poor Traffic Operation	o The flag-person directs traffic against traffic/safety signals	o The flag-person should follow the safety signals provided	o Contractor o Health and safety officer o Flag-person

PROBLEM	CAUSE	COUNTERMEASURE	RESPONSIBLE
	○ The flag-person uses sign posts which are not visible at distance or during darkness periods to direct traffic	○ New and visible sign posts should be provided	○ Contractor ○ Health and safety officer ○ Flag-person
	○ Many obstructions such as construction materials, construction equipment, and construction wastes are occupied in road spaces.	○ All obstructions should be removed on the road space and corridor	○ Contractor ○ Health and safety officer ○ Flag-person
○ Poor traffic management facilities	○ Road markings are non-existent or out of paint and lanes are not marked on the roadway near project activities	○ Ensure all required sign posts are installed or marked on the roadway near project activities	○ Contractor ○ Health and safety officer ○ Flag-person
	○ Very few or poorly made road signs are installed on the road construction corridor and junctions.	○ Ensure worn out sign posts are removed and replaced by new ones	○ Contractor ○ Health and safety officer ○ Flag-person
○ Poor traffic Signals	○ No truck, construction machineries and vehicle drivers follow traffic signal	○ Ensure all drivers comply with traffic signs. Failure to comply sanctions should be provided	○ Contractor ○ Health and safety officer ○ Flag-person
	○ Some of the traffic signals are malfunctioning.	○ Ensure malfunctioning sign posts are replaced	○ Contractor ○ Health and safety officer ○ Flag-person
○ Poor compliance for drivers	○ Most people do not follow traffic rules properly most of drivers are not well-trained or are reluctant to abide by the traffic rules.	○ Toolbox meetings about traffic rules should be provided to all workers and drivers	○ Contractor ○ Health and safety officer ○ Flag-person

12.2 ROAD SAFETY SIGNS

Road safety signs to be used for the water supply project can be are classified basing on the purpose and message intended as:

- ***Regulatory signs:*** regulatory road sign are signs that are used to indicate or reinforce traffic laws, regulations or requirements which apply either at all times or at specified times or places upon a road, street or highway under use or construction the disregard of which may constitute a violation, or signs in general that regulate public. These include signs indicating: Stop, Do not enter, No parking, No hooting, Slow down, Students crossing, Speed Limit, Road closed, etc.
- ***Warning signs:*** Warning sign is a type of sign which indicates a potential hazard, obstacle or condition requiring special attention. Some are traffic signs that indicate hazards on roads that may not be readily apparent to a driver. The warning signs usually contain a symbol and include signs indicating: Men at Work, Narrow road, Humps ahead, Zebra crossing, etc.
- ***Advisory signs:*** Advisory sign posts are often seen under a warning sign and typically placed at sharp curves, exits, or exit ramps.

In addition to these signs, they may be permanent or temporally depending on the purpose and intended message.

CHAPTER 13: CHANCE FIND PROCEDURE

13.1 PURPOSE OF THE CHANCE FIND PROCEDURE

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during project design, construction or operation. A Chance Find Procedure, is a process that prevents chance finds from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements are implemented.

13.2 RESPONSIBILITY

WASAC as the implementation institution is responsible for siting and designing the project to avoid significant damage to cultural heritage. When the proposed location of a project is in areas where cultural heritage is expected to be found, either during construction or operations, the client will implement chance find procedures established through the Social and Environmental Assessment. The client will not disturb any chance finds further until an Assessment by a competent specialist is made and actions consistent with the requirements of this Performance Standard are identified.

13.3 SCOPE OF THE CHANCE FIND PROCEDURE

This procedure will be applicable to all activities conducted by the personnel, including contractors for the project that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

13.4 INDUCTION/TRAINING

All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.

13.5 CHANCE FIND PROCEDURE

If any person/worker under the project discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken:

1) Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained especially the Institute of National Museums of Rwanda (INMR);
2) Immediately notify the foreman. The foreman will then notify the Site engineer and the Environment Officer of the contractor;
3) Record details in Incident Report and take photos of the find;

4) Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
5) Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
6) Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the INMR, once completed.
7) In case of significant find the INMR, will be informed immediately and in writing within 7 days from the find,
8) The onsite archaeologist provides INMR with photos, other information as relevant for identification and assessment of the significance of heritage items.
9) The INMR will investigate the fact and provide response in writing.
10) Decisions on how to handle the finding shall be taken by the responsible authorities which is INMR. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
11) Construction works could resume only after permission is granted from the responsible authorities.
12) In case no response received, this will be considered as authorization to proceed with suspended construction works.

One of the main requirements of the procedure is record keeping. All finds must be registered. Photolog, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports are kept.

Additional information: Management options for archaeological site

- *Site avoidance*. If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost-effective management option);
- *Mitigation.* If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation. (The most expensive and time-consuming management option.)
- *Site Protection*. It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

13.6 MANAGEMENT OF REPLICABLE AND NON-REPLICABLE HERITAGE

Different approaches for the finds apply to replicable and non-replicable heritage.

Replicable heritage

Where tangible cultural heritage that is replicable (Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.) and not critical is encountered, mitigation measures will be applied.

The mitigation hierarchy is as follows:

a) Avoidance;
b) Minimization of adverse impacts and implementation of restoration measures, in situ;
c) Restoration of the functionality of the cultural heritage, in a different location; Permanent removal of historical and archaeological artefacts and structures;
d) Compensation of loss - where minimization of adverse impacts and restoration not feasible.

Non-replicable heritage

Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage.

Nonreplicable cultural heritage (Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site. Examples of non-replicable cultural heritage may include an ancient city or temple, or a site unique in the period that it represents.) must not be removed unless all of the following conditions are met:

a) There are no technically or financially feasible alternatives to removal;
b) The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

13.7 HUMAN REMAINS MANAGEMENT OPTIONS

The handling of human remains believed to be archaeological in nature requires communication according to the same procedure described above.

There are two possible courses of action:

a) Avoid. The development project is redesigned to completely avoid the found remains. An assessment should be made as to whether the remains may be affected by residual or accumulative impacts associated with the development, and properly addressed by a comprehensive management plan.
b) Exhume. Exhumation of the remains in a manner considered appropriate by decision makers. This will involve the predetermination of a site suitable for the reburial of the

remains. Certain procedures may need to be followed before development activities can recommence in the area of the discovery.

EMERGENCY CONTACTS

INSTITUTE OF NATIONAL MUSEUMS OF RWANDA (INMR)
Address : KN 90 St2, Kigali
Telephone : 0730 741 09
Email: info@museum.gov.rw
Website: www.museum.gov.rw

CHAPTER 14 GRIEVANCE REDRESS MECHANISM DURING PROJECT CONSTRUCTION AND OPERATION PHASE.

14.1 Introduction

The Article 33 and 34 of the Expropriation Law No 32/2015 of 11/06/2015 provides complaints procedures for individuals dissatisfied with the value of their compensation. The Article 33 of the expropriation Law stipulates that dissatisfied persons have a period of 10 days from the application for counter valuation by the person to be expropriated. This application should be done within 7 days after the approval of the valuation report by the expropriator.

Under the operational safeguards 1, of the African Development Bank, states that the borrower or client establishes a credible, independent and empowered local grievance and redress mechanism to receive, facilitate and follow up on the resolution of affected people's grievances and concerns about the environmental and social performance of the project. The local grievance mechanism needs to be accessible to the stakeholders at all times during the project cycle, and all responses to grievances are recorded and included in project supervision formats and reports.

Taking into account the complexity of resolving disputes and grievances, PAPs have to be informed about various grievance redress procedures and of their right to appeal if not satisfied. This section therefore describes avenues through which PAPs can lodge complaints/grievances related to land acquisition and compensation. It describes stages and procedures to be followed during grievance Management.

A Grievance Resolution Mechanism (GRM) is a system by which queries or clarifications about the project are responded to, problems with implementation are resolved, and complaints and grievances are addressed efficiently and effectively.
It is best practice for the grievance mechanism to clarify at the outset who is expected to use the procedure, and to assure stakeholders that there will be neither costs nor retribution associated with lodging a grievance. The entire process (i.e. how a complaint is received and reviewed, how decisions are made and what possibilities may exist for appeal) will be made as transparent as possible by putting it into writing, publicizing it and explaining it to relevant stakeholders.

Different categories of grievances/complaints are expected during the different stages of the RAP implementation and project execution. These are categorized into social, survey, valuation and legal grievances as shown below.

- Social: Family disputes, land disputes, deceased PAPs, minors, mentally ill, the vulnerable.
- Survey: Objection to computed land size of the affected land, omission of PAPs land, missing
- PAPs, and land tenure system complaints. These may require re-surveys.
- Valuation: Rejection of compensation package considered low value, PAPs missing in approved
- Valuation Report, property not captured during the initial assessment, discrepancy of information

- Appearing on Strip map and Valuation report. These may require re-valuations or explanation to clarify issues.
- Legal: PAPs requiring legal assistance and advice in acquiring of legal documents.

This grievance procedure will not replace existing legal processes in Rwanda but rather will seek to resolve issues quickly so as to expedite receipt of entitlements and smooth resettlement without resorting to expensive and time-consuming legal processes.

The general objective of the proposed grievance mechanism is to provide a mechanism/process to receive and respond timely to any complaints made about the Project from different stakeholders (including those from members of the communities, local businesses and other stakeholders) and to be the basis for developing appropriate mitigation strategies.

14.2 Specific objectives of the GRM include

- Establish a mechanism for responding to complaints in an understanding, transparent and culturally appropriate way;
- Develop an accessible, transparent and efficient complaint procedure for people involved and/or impacted by the KIREHE Water Supply Project;
- Facilitate effective dialogue and open lines of communication with the public;
- Manage expectations and/or negative perceptions towards KIREHE Water Supply Project;
- Establish a system of investigation, response and prompt complaint resolution;
- Minimize grievances regarding KIREHE Water Supply Project
- Improve the Project social performance by evaluating complaints as a basis for taking remedial or preventive actions or developing responsive initiatives.

The grievance mechanism will ensure that all Project Affected Persons (PAPs) including vulnerable groups e.g. the elderly, women and the disabled can easily access help at no cost.

14.3 Common likely types of grievances and disputes in resettlement process

In practice, grievances and disputes that are most likely during the implementation of a resettlement program are the following:

- Misidentification of assets or mistakes in valuing them
- Disputes over plot limits, either between the affected person and the Project, or between two neighbours;
- Dispute over the ownership of a given asset (two individuals claim to be the owner of this asset); e.g. due to recent change of asset ownership
- Disagreement over the valuation of a plot or other asset; and
- Successions, divorces, and other family issues, resulting in disputes between heirs and other family members, over ownership or ownership shares for a given asset.

14.4 Grievance Management Mechanism

The experience has shown that many grievances derive from misunderstandings of the Project policy, or result from neighbour conflicts, which can usually be solved through adequate mediation using customary rules. Most grievances can be settled with additional explanation efforts and some mediation using customary disputes settlement mechanisms:

- Through explanations (for instance explain in detail how the Project calculated the complainant's compensation and that the same rules apply to all); or
- Through arbitration, resorting to elders or individuals well-regarded by the community and external to it.

In contrast, resorting to the judicial system often results in long delays before a case is processed, may result in significant expenses to the complainant, and requires a complex mechanism, involving experts and lawyers, which can fall well beyond the complainant's control, and be counterproductive to him/her. Also, courts may declare themselves not competent for matters related to informally owned property. Therefore, the Project will put in place an extra-judicial mechanism for managing grievances and disputes arising from the resettlement process based on explanation and mediation by third parties. Each of the affected persons will be able to trigger this mechanism, while still being able to resort to the judicial system. Procedures relevant to this amicable mechanism are detailed below. It will include three different levels.

- Registration of the complaint, grievance or dispute case by WASAC in collaboration with the Grievance Redress Committee GRC;
- Processing of the grievance or dispute until closure is established (within 15 days) based on evidence that acceptable action was taken by WASAC; and
- In the event where the complainant is not satisfied with action taken by WASAC as result of the complaint, an amicable mediation can be triggered involving a mediation committee independent from the Project.

14.4.1 Amicable Resolution Mechanism

Complaints that cannot be closed to the complainant's satisfaction will be handed over to the GRC that will include the following individuals:

- One representative of the local Administration;
- One Contractor's representative;
- Three representatives of the affected people, including at least one woman, amongst community based organizations, elders, customary authorities,
- One representative of an NGO present in the project area where applicable.

The main function of the committee would be arbitration and negotiation based on transparent and fair hearing of the cases of the parties in dispute between PAPs and the implementing agencies for local government. The committee gives solution to grievances related to compensation amounts, delays in payment of compensation or provision of different type of resettlement assistance.

14.4.2 Processing

After a complaint or dispute has been registered, WASAC will prepare the technical background to the complaint (for instance, the proposed compensation amount, the list of meetings and interviews with the complainant, a description of the exact reason of the dispute, etc.) for consideration by the mediation committee. The complainant(s) will be invited before the mediation committee, which will mediate and attempt to propose a solution acceptable to both parties (WASAC and complainant). If need be, other meetings will be held and the committee may resort to one of its members to arbitrate in a less formal framework than meetings, if appropriate.

If reached, the agreement will be sanctioned by a settlement agreement signed by the parties, and the chair of the mediation committee will be responsible for monitoring the implementation of this agreement, which will include all references to the applicable local law provisions.

Grievance resolution is encouraged to be resolved at Cell level, as they are aware of and involved in the whole process. If the grievance is not resolved in this way, local courts (ABUNZI) should be used. If not resolved, then the high court or court of appeal of Rwanda remains an avenue for voicing and resolving these complaints.

14.6 Proposed stages for the GRM during project implementation

A simple Grievance Redress Mechanism (GRM) has been proposed to enable timely settlement of grievances to the PAPs. The grievance procedures will be anchored and administered at the local level to facilitate access, flexibility and openness to all PAPs. The grievance redress procedure ensures involvement with the respective districts and sector officials and other key stakeholders and provides for record keeping to determine the validity of claims, and to ensure that solutions are taken in the most transparent and cost effective ways for all PAPs. The grievance resolution mechanism will involve three stages as illustrated

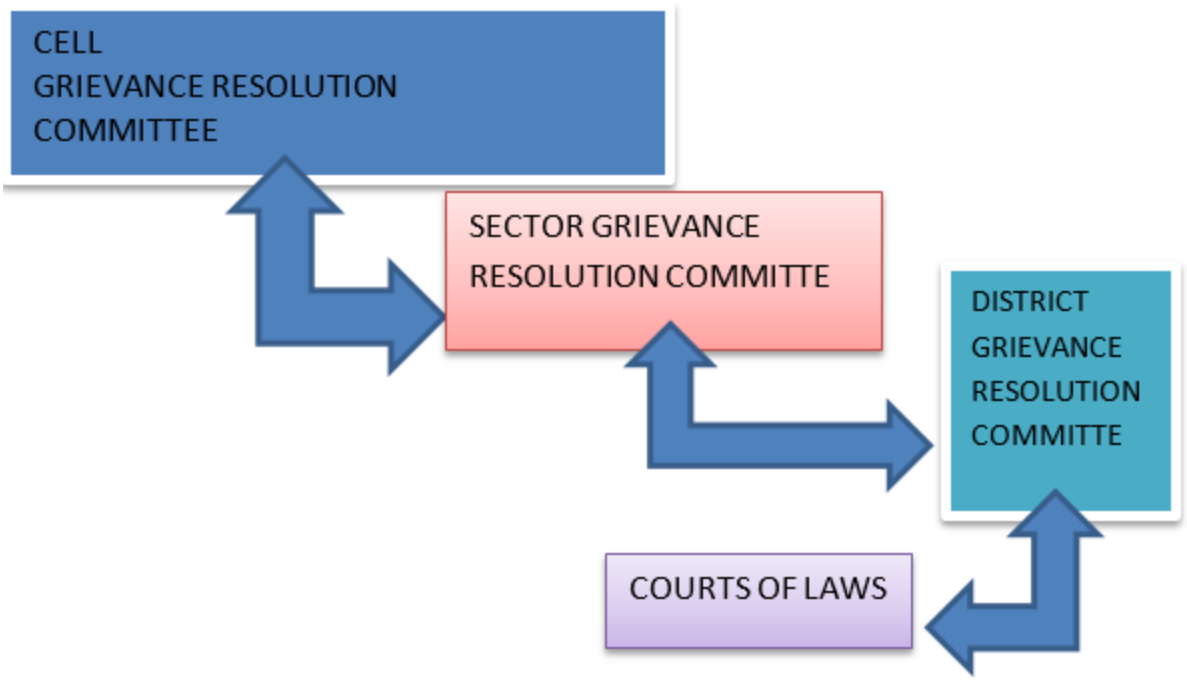


Figure : Grievance Resolution Stages

Stage I: Cell Grievance Resolution Committees

Grievance resolution committees will be constituted at Cell level in which the water supply project is located. The resettlement committees at this level will be setup. The grievance resolution committees will comprise of the following members:

- Cell Executive Secretary
- Social protection officer of the cell
- Village leaders
- Women Representatives
- Vulnerable representative
- PAP representative

Each Grievance Resolution Committee is expected to select a Chairperson and a Secretary. Representatives of community members on the GRC committees will be chosen by their respective communities during village meetings/community gatherings. The selection criteria will be jointly developed with the affected communities. The following could be used as a guide when selecting community members on the GRCs:

The GRC member shall be one of the affected persons;
The GRC member must be of good standing in the community, possess local knowledge and be willing to represent the interests of the PAPs; and
The GRC member must be trustworthy and available to attend meetings whenever called upon.
The communities will evaluate the selection criteria above to identify the person(s) best suited to represent them on the GRCs.
Each Committee will be responsible for grievances in their cells. The Cell GRC will work with the respective village leaders to solve a grievance. If the grievance is solved at this level, it will then be closed. However, if the grievance is not resolved, it will be forwarded to the Sector GRC for further management.

Stage II: Sector Grievance Resolution Committees

Sector authorities will participate in grievance redress thus the need to establish a grievance resolution committee at the sector level. The grievance redress committees at the sector level will comprise of the following members:
Sector Executive Secretary of the sector
Social protection officer of the Sector
Sector Land officer
Women Representatives
Vulnerable representative
PAP representative

The Sector GRC will get background information as much as possible about the case from cell GRCs. If the Sector GRC solves the grievance, it will then be closed. However, if the parties fail to agree, the matter will be forwarded to the District level.

Stage III: District Grievance Resolution Committees

District authorities will participate in grievance redress thus the need to establish a grievance resolution committee at the District level. The grievance redress committees at the district level (KIREHEKIREHE and KIREHE Districts) will comprise of the following members:

- Vice Mayor in charge of social affairs

- Social Protection officer of the District
- District Land Officer;
- Environmental Officer
- District Land Officer
- PAP representative

The District GRC will get background information as much as possible about the case from the Sector GRCs. If the District GRC solves the grievance, it will then be closed. However, if the parties fail to agree, the affected person can utilize the Courts of Law as a last resort to solve them grievances. The Grievance Resolution Committees will utilize all avenues to solve grievances before the affected parties can go to the courts of law.

Stage IV: Courts of Law

The Government of Rwanda (GoR) legislation allows a right of access to the courts of law by any person who has an interest or right over property. If the grievance procedure fails to provide a settlement, complainants can still seek legal redress in courts of law as a last resort.

Grievance should be recorded in a log by WASAC grievance manager. He will record all information of peoples complained, nature of complaint, how it was resolved and timeframe for close-out. The suggested grievance handling procedure can be summarized as follows:

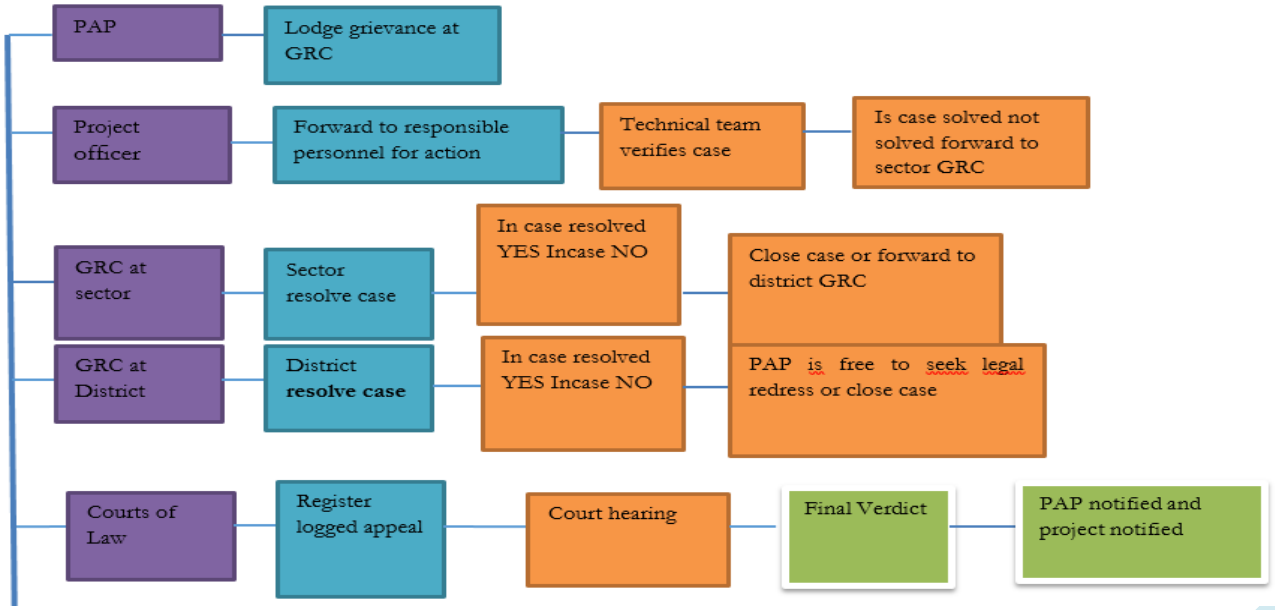


Figure : Proposed grievance resolution process for Nzove I WTP rehabilitation project

14.6 Inclusion of Women and other Vulnerable Groups

The GRCs will be sensitive to the needs of women and other vulnerable groups. For instance, meeting venues and times will take into consideration the limitations of such groups. All aggrieved parties will have access to the grievance resolution team at no cost.

14.7Training

Members of the Grievance Resolution Committees at the different levels of local government will be trained in grievance management from the project developer side. The main topics of discussion will include GRC roles, channels of communication, guiding principles etc. The training will be conducted by the RAP implementing team.

14.8The Grievance Database Management

A database will be established and will be updated weekly by the Project Liaison Officer. The database will be designed to make it easy to track individual grievances, giving each grievance a reference number and will show deadlines for progress on grievance communications and resolution. The grievance database will specify the actions for each grievance and the status of the grievances. Where it has not been possible to resolve grievances to the satisfaction of both parties, this will be specified in the database and unresolved grievances assessed during third party monitorin

CHAPTER 15: CONCLUSIONS AND RECOMMENDATIONS

15.1. CONCLUSIONS

This rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali Project has many obvious benefits from the socio-economic point of view. The impact assessment process carried out has indicated the existence of a number of negative environmental impacts that may arise from implementation of this project

The scoping exercise identified a number of issues pertaining to the proposed project. The issues/impacts have been assessed and described in some details to gain an adequate understanding of possible environmental and social effects of the proposed project – from design to operation phase, in order to formulate mitigation measures in response to negative aspects in case they emerge.

The Environmental and Social Management Plan (ESMP) provides a way forward for implementation of the identified mitigation measures. The ESMP should be implemented as a prerequisite for a positive Record of Decision (RoD) by the appropriate Authorities.
The estimated costs of implementing the mitigation measures are just indicative. Appropriate bills of quantities should clearly give the actual figures. In any case the consultant has used informed judgement to come up with these figures.

The Environmental and Social Monitoring Plan provides parameters to be monitored, the monitoring frequency and responsible parties. While the consultant is aware that each monitoring aspect need to have a separate budget line, for small projects which are remotely located this does not make economic sense. The consultant is recommending that the Project Proponent assigns an Environmental Officer or independent environmental expert to undertake the monitoring of the mitigation measures for the project through its existence. This is the way the proponent will achieve sustainable project implementation at reduced cost for undertaking the monitoring. The figures given are considered to be absolute maximum such monitoring could cost. However, regular internal monitoring shall be carried out by the project proponent.

Given the nature and location of the water supply project, the conclusion is that the potential impacts associated with the proposed rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali project are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate environmental and social mitigation measures.

15.2. RECOMMENDATIONS

Based on the nature of the rehabilitation of Nzove 1 water treatment plant and water distribution network in Kigali Project activities, biophysical conditions of the project area and the potential negative impacts, it is imperative that the following be given serious considerations and attention in order to preserve the environment:

- Environmental monitoring programs for this project should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during construction, operation and decommissioning phases. An environmental and Social Officer should be hired to monitor the implementation of the ESMP;

- Occupational health and safety performance should be evaluated against national /or international standards and a full time Health and Safety officer recruited during project implementation,
- The developer should try to reduce through tool box meeting and induction trainings; the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities.
- Awareness programmes on HIV/Aids, STD and COVID 19 should be carried out regularly and mitigate the propagation of these diseases by providing all necessary facilities,
- WASAC is recommended to take in consideration issues and concerns raised during public consultation especially issues related to compensation and jobs opportunity
- Discourage construction workers from engaging in any activity that might have a negative impact on the social and economic welfare of the local communities.
- Implement soil erosion control measures in order to avoid surface run off and prevents siltation.
- Ensure that garbage, sanitation and drinking water facilities are provided in construction workers camp. Site.
- Ensure that as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
- As far as it is possible, the recruitment of unspecialized manpower should benefit the population of the area of the project and thus contribute to poverty reduction.
- The entirety of solid and liquid wastes generated by the building site, including packages, food waste, will have to be collected and removed to an adequate dumping place.
- GBV and CAE should be avoided and whenever there is any violence, child abuse and exploitation, it should be reported to competent authorities.

Based on the study, the Consultant is of the opinion that most of the potential environmental and social impacts identified can be mitigated. The proposed environmental management plan and environmental monitoring plan if implemented, will safeguard the integrity of the environment, surrounding communities and beneficiaries

REFERENCES

- *Rwanda's Vision 2050.*
- *National Strategy for Transformation 1(NST1) for Rwanda 2017-2024.*
- *The Constitution of the Republic of Rwanda 2003 and 2015.*
- *Rwanda's Law on Environment 2018.*
- *World Bank Environmental and Social Framework, 2018.*
- *Law determining the use and management of water resources in Rwanda 2018.*
- *Law governing electricity in Rwanda 2011.*
- *National occupational, Safety and Health Strategy for Rwanda 2019.*
- *Rwanda's Urbanization and rural settlement Sector strategy 2017 for 2018-2023.*
- *Rwanda's National Biodiversity strategy and action Plan 2016.*
- *Rwanda's National Policy for Water resources management 2011.*
- *Rwanda's National Health Policy 2016.*
- *Rwanda's National Transport Policy 2012.*
- *Energy Policy for Rwanda 2004.*
- *Rwanda Environment and Climate Change Policy 2019.*
- *Rwanda Vision 2020, 2001.*
- *Law no. 18/2007 of 19/04/2007 relating to expropriation in the public interest for Rwanda 2007.*
- *Ministerial order No. 003/2008.Relating to the requirements and procedure for Environmental Impact Assessment, for Rwanda 2008.*
- *Ministerial Order establishing the list of projects that must undergo environmental impact assessment, instructions, requirements and procedures to conduct environmental impact assessment for 2019.*
- *Ministerial order No. 007/2008.Establishing the list of Animal and plant species, for Rwanda 2008.*
- *National Land policy for Rwanda 2004.*
- *Sector policy on water and sanitation in Rwanda 2004.*
- *Law N° 08/2005 of 14/07/2005.Determining the use and management of Land in Rwanda 2005.*

Apendix1:public meeting and participation

UMUJYI WA KIGALI
AKARERE KA NYARUGENGE
UMURENGE WA KANYINYA
AKAGARI KA NZOVE
UMUDUGUDU WA BWIZA

6/15/2023

TWEBWE UBUYOBOZI BW'UMUDUGUDU WA BWIZA
TURIKUMWE NABAKOZI BAHAGARARIYE ICYIGO GISHINZWE
ISUKU NI SUKURA WASIC TWAKORANYE INAMA NABATURAGE
BAFITE IMITUNGO AHAZAKORERWA IMIRIMO IJYANYE
NUMUSHINGA WO KUVUGURURA NOGUSANA URUGANDA
RWAMAZI RWA NZOVE ABATURAGE BASOBANURIWE
IBIJYANYE NUMUSHINGA WA NZOVE BASOBANURIRWA
ICYO BITEZWEHO: ABATURAGE BABWIWE N'ITEGEKO
RIGENGA INGURANE BASOBANURIRWA IBISABWA
KUGIRANGO UMUNTU AHABWE INGURANE MUGIKE GIBARAGAYE KO
UMUTUNGO WE UZAGIRWAHO INGARUKA NIMIRIMO YUMUSHINGA
WA NZOVE
ABITABIRIYE INAMA BISHIMIYE AMAKURU BAHAWE NDETSE
BAGIYE KUYAGEZA KURIBAGENZI BABO BATABASHIJE KUBONEKA
KANDI BIJEJE UBUTAHA MWISHYIRWAMUBIKORWA
RYUWO MUSHINGA
UMWANDITSI WINAMA SEBAGINA Rafis

Ubuyobozi bw'Akagari

UMURENGE WA KANYINYA - AKAGALI K'NZOVE

Kabagaba Ignace
E/S Nzove Cell

Urutonde rwabitabiriye inama ku mushinga w'amazi wa Nzove

District: NYARUGENGE
Sector: KANYINYA
Cell:NZOVE

No	AMAZINA	IGITSINA	UMUDUGUDU	Telephone	UMUKONO
1	Mukamuhima Marie Rose	gore	wabuiza	0783939 168	[illegible]
2					
3					
4					
5					
6					
7					
8					
9					
10					

Urutonde rwabitabiriye inama ku mushinga w'amazi wa Nzove

District: NYARUGENGE
Sector: KANYINYA
Cell:NZOVE

No	AMAZINA	IGITSINA	UMUDUGUDU	Telephone	UMUKONO
1	mukobigina torinzisiya	Gore	RUYENZI	0729303695	[illegible]
2	Ntwali Ramadhani	Gabo	Ruyenzi	0783527428	[illegible]
3	Nyirasofani Yozaat	Gore	Gotoko		
4	KANTAMAHANGA	GABO	Bwiza	0782771014	[illegible]
5	Habumugisha Themeste	M	BWIZA	0789036974	[illegible]
6	NDAYIMNE Erick	M	BWIZA	0792061134	[illegible]
7	NGIRIMANA Sedrick	M	BWIZA	0791739535	[illegible]
8	Tuyizere innocent	M	BWIZA	0782964964	[illegible]
9	MUKANDORI Efufamia	F	BWIZA		
10	MUKANDAHIRO Afrodosia	F	BWIZA	—	[illegible]

Urutonde rwabitabiriye inama ku mushinga w'amazi wa Nzove

District: NYARUGENGE

Sector: KANYINYA

Cell:NZOVE

No	AMAZINA	IGITSINA	UMUDUGUDU	Telephone	UMUKONO
1	Niyibizi Theophile	M	BWIZA	0784031137	[illegible]
2	UMUHOZA Koline	F	BWIZA	~	[illegible]
3	MUKESHIMANA Silivia	F	GATEKO	0793339358	[illegible]
4	Mukamgandwi Leoncie	F	Buiza	0798598817	[illegible]
5	Zigilinshuti Felicien	M	Ruyenzi	0785343512	[illegible]
6	Nifi zere	F		07279	624 [illegible]
7	Nsanzimana Silive		Buiza	0785378605	[illegible]
8	Turinumukiza Uracelle	F	Buriza	0791399939	[illegible]
9	Rugumire Jeno Damascene	M	Buriza	0788555311	[illegible]
10	NDAGIJEMARIYA	gore	BWIZA	0789460873	[illegible]

Urutonde rwabitabiriye inama ku mushinga w'amazi wa Nzove

District: NYARUGENGE
Sector: KANYINYA
Cell:NZOVE

No	AMAZINA	IGITSINA	UMUDUGUDU	Telephone	UMUKONO
1	Niyoyita J. de Dieu	Gabo	Gatiko	0782895455	[illegible]
2	NyiraHABIMANA Eugenie	Gore	KAGASA	0789612836	[illegible]
3					
4	MUKANKEZIRYAYO Giselle	Gore	Busiza	0781677130	[illegible]
5					
6					
7					
8					
9					
10					

Urutonde rwabitabiriye inama ku mushinga w'amazi wa Nzove

District: NYARUGENGE
Sector: KANYINYA
Cell:NZOVE

No	AMAZINA	IGITSINA	UMUDUGUDU	Telephone	UMUKONO
1	Niyonambaza Immaculee	Gore	Bwiza	0786957730	[illegible]
2	Harakorimana célestin	gabo	Bwiza	—	[illegible]
3	Niyirabo tesi Charlotte	Gore	Ruyenzi	0789030728	[illegible]
4	mukantaindwa Clementine	Gore	Gateko	0780073947	[illegible]
5	Mumalamugu Mbose	Gore	Bwiza	078593520	[illegible]
6	Nkiriyehe Eliphaz	Gabo	Bwiza	0784707576	[illegible]
7	KAMPIRE Vestine	Gore	Gateko	07	[illegible]
8	MUKARUBAYIZA Monique	Gore	Ruyenzi	0783331780	[illegible]
9	KAMUHANDA	Gabo	BWIZA	0788961298	[illegible]
10	SEBAGINA Régis	F	BWIZA	0782373986	[illegible]