



**ATHI WATER SERVICES  
BOARD**  
**Nairobi**  
Republic of Kenya



Financial Cooperation between  
Kenya and Germany  
With Support of KfW Development  
Bank



Technical Implementation  
Consultant for:

**Nairobi Satellite Towns Water  
and Sanitation Development  
Programme (NST-WSDP),  
Phase 1  
Ruiru-Juja and Kiserian-  
Ongata Rongai Water Supply  
Projects**

Contract No. AWSB/KfW/NST-  
WSDP/CS-01/2015

**ESIA Study Report: Greater  
Githurai / Ruiru Juja Water  
Supply System**

May 2018



## CERTIFICATION

**Report Title:** Environmental Impact Assessment Study for the Proposed  
ESIA Study Report: Greater Githurai / Ruiru Juja Water  
Supply System

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## ABBREVIATIONS

AWSB	Athi Water Services Board
CEMP	Construction Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FS	Feasibility Study
GIS	Geographic Information System
GoK	Government of Kenya
IPCC	Intergovernmental Panel on Climate Change
KfW	German Development Bank
KES	Kenyan Shilling
MDG	Millennium Development Goals
NCWSC	Nairobi City Water and Sewerage Company
NST-WSDP	Nairobi Satellite Towns Water and Sanitation Development Programme
O&M	Operation and Maintenance
RAP	Resettlement Action Plan
RUJWASCO	Ruiru-Juja Water and Sewerage Company
ToR	Terms of Reference
WSB	Water Services Board
WSP	Water Service Providers
WTP	Water Treatment Plant
RJ01	Ruiru – Juja Water Supply Project
TIC	Technical Implementation Consultants
PEA	Project Executing Agency
SUP	Social Uplifting Project



## EXECUTIVE SUMMARY

### Introduction

The German Government through the cooperation area "*Development of the Water and Sanitation Sector*" with the Kenyan Government, has financed the "Nairobi Satellite Towns Water and Sanitation Development Programme" (NST-WSDP) to support the satellite towns that face large water supply deficits with chronic water shortages, water rationing, high prices paid to water vendors, time spent queuing for water and incidence of water borne diseases.

Ruiru – Juja Water Supply Project (RJ01) is one of the projects that has been selected for implementation under the NST-WSDP. The Project Area is growing fast due to good transport connections to Nairobi and relatively cheaper accommodation. Currently, Nairobi City Water and Sewerage Company (NCWSC) is the known supply of potable water within the project area. An inventory of the water sources within the project area indicated that there is inadequate and intermittent supply of water within the project area. In particular, the estimated water demand of the project area in 2016 was about 5,000 m<sup>3</sup>/day by NCWSC managed to supply about 10% of the needed which was also intermitted. The dry spells experienced in 2017 which led to water rationing within and around Nairobi are expected to have resulted into further reduction on the amount of water supplied to the project area. Projected water demand for the project area indicates that in 2018, it will increase from 5,000 m<sup>3</sup>/day to 10,922 m<sup>3</sup>/day which is expected to continue increasing, reaching 42,988 m<sup>3</sup>/day in 2035. This project will be implemented to provide a supplementary source of potable water within the project area.

Athi Water Services Board (AWSB), the Project Executing Agency (PEA) on behalf of the Government of Kenya, is undertaking this project and, has engaged Ms. Posch & Partners Consulting Engineers and Ms. Norken International Ltd (in a consortium) as the Technical Implementation Consultants (TIC) to carry out the detailed designs, tendering and construction supervision for the above described measures.

The ESIA study is one of the studies undertaken which has resulted in this report. The ESIA study was conducted in line with the requirements of the laws of the government of Kenya as well as lender requirements such as the KfW sustainability guidelines and the World Bank environmental and social framework.

The specific objectives of this ESIA Study Report are as follows:

- Provision of an overall assessment of the social and biophysical environment affected by the project;
- Identification and detailed assessment of potentially significant impacts associated with the project;
- Identification and recommendation of appropriate mitigation measures for potentially significant environmental and social impacts;

- Public/stakeholder consultations to ensure that the affected communities are engaged throughout the ESIA process and their issues and concerns addressed;
- Developing an Environmental and Social Management Plan necessary to minimize, mitigate any potential environmental impacts identified by the ESIA; and
- Preparation of an ESIA Study report in accordance with the requirements of the Environment (Impact Assessment and Audit) Regulations, 2003.

### Project Location

The Project is located in Kiambu, Juja and Ruiru sub-counties, Kiambu County, Central Kenya. The Project area of interest is the Greater Githurai area, comprising the sub-locations of Kiuu, Mwiki, Kahawa Wendani, Kahawa Sukari, Mwihoko A and Mwihoko B.

The water abstraction point is along River Ruiru at Jacaranda where Ruiru-Juja Water and Sewerage Company (RUJWASCO) is already permitted to abstract 13,000 m<sup>3</sup>/day. The RUJWASCO project is already operational.

### Project Description

The main project components are presented in the table below.

Component	Proposed works
Water source – Jacaranda Intake	<ul style="list-style-type: none"> <li>• Removal of existing raw water pumps from PS; and</li> <li>• Replacement with 4 vertical split case pumps, H=50, Q=583 (2 duty, 2 standby), incl. associated pipework and E&amp;M.</li> </ul>
Raw Water Pumping Main	Construction of a second raw water pumping main parallel to the existing, approximately 1 km long, OD 450 PN 10 HDPE.
Water treatment	<p>Upgrading Jacaranda WTP from 15,000 m<sup>3</sup>/d to 28,000 m<sup>3</sup>/d by:</p> <ul style="list-style-type: none"> <li>• Construct 2<sup>nd</sup> treatment line consisting of: <ul style="list-style-type: none"> <li>○ Inlet structure;</li> <li>○ 2 No. Flocculation basins;</li> <li>○ 2 No. Sedimentation tanks;</li> <li>○ 4 No. Rapid Gravity Sand Filters; and</li> <li>○ Gravity Sludge Drying Beds.</li> </ul> </li> <li>• Additional Works: <ul style="list-style-type: none"> <li>○ Replace Elevated Backwash Tank pumps to higher capacity for quicker filling of existing backwash tank;</li> <li>○ Install one additional backwash blower; and</li> <li>○ Construct additional chemical storage, mixing and dosing building for alum and soda ash dosing.</li> </ul> </li> </ul>
Transmission main	<ul style="list-style-type: none"> <li>• Construction of a dedicated 6.8 km DN 600 steel pipe from Jacaranda Water Treatment plant to Ruiru;</li> <li>• Installation of connection piece for future interconnection of Karimenu II transmission main; and</li> <li>• Construction of a dedicated 6.1 km DN 800 steel pipe from Ruiru to Githurai (Kahawa Sukari).</li> </ul>

<b>Component</b>	<b>Proposed works</b>
Water distribution	<p>Dependent on available budget, construct 168 km of ring mains and distribution network in Greater Githurai area of Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari (OD63 to DN800):</p> <ul style="list-style-type: none"> <li>• 61.8 km – OD 63;</li> <li>• 31.3 km – OD 90;</li> <li>• 20.1 km – OD 110;</li> <li>• 15.8 km – OD 160;</li> <li>• 19.5 km – OD 225;</li> <li>• 10.1 km – OD 355;</li> <li>• 2.0 km – DN 400;</li> <li>• 4.4 km – DN 500;</li> <li>• 1.5 km – DN 600; and</li> <li>• 1.2 km – DN 800.</li> </ul>
Consumers	<ul style="list-style-type: none"> <li>• Supply and install 84 km OD 20 High-Density Polyethylene (HDPE) for consumer connections;</li> <li>• Supply and install 6,300 consumer water meters (DN 15 c/w box); and</li> <li>• Supply and install 2,100 consumer water meters (DN 25 c/w box).</li> </ul>
Equipment	Supply operation and maintenance equipment.

The Project construction is expected to take at least 18 months, with a defects liability period of a further 12 months.

### **Project Alternatives**

The Project prioritisation was undertaken during the conduct of the Feasibility Study (FS) in 2014 by a different consultant. This has been re-evaluated during the preparation of the Detailed Design Report. During FS conducted by a different consultant in 2014, all available investment proposals and other identified proposals were reviewed, in conjunction with AWSB, and the WSPs. Out of this process, a total of 68 project proposals in the satellite towns of Nairobi were identified and assessed. Based on a further analysis based on five main criteria; target area, overall water supply and sanitation situation, poverty reduction, cost efficiency and performance of the WSP, a total of 25 projects, dubbed “last mile investments” that build on existing investments (e.g. water sources available but no network) were prioritized for further studies and implementation. The Ruiru – Juja Water Supply Project (RJ01) is one of the two projects out of the 25 that have been selected for financing during the current first project phase.

Alternative water supply projects within the project area were also assessed to ensure complementarity where possible and maximisation of benefits.

### **Legal and Administrative Framework**

All the relevant national and county policies, laws, regulations and institutions were reviewed and discussed to ensure total compliance with the governing laws and regulations as well as contributing towards achievement of the objectives of the operational policies. Liaison with the identified relevant institutions will further contribute towards the success of the proposed project. The identified national policies, laws and guidelines include:

- Vision 2030;
- Session Paper No.10 of 2014 on the National Environment Policy, 2014;
- National Water Policy;
- The Constitution of Kenya;

- The Environment Management and Coordination Act, 1999 (and the amendments of 2015);
- The Water Act, 2016;
- The Public Health Act (Cap. 242);
- Employment Act, 2007;
- Work Injury Benefits Act (WIBA);
- The Occupational Safety and Health Act, 2007;
- Land Act, 2012 and the 2016 Amendments; and
- Kiambu County Water and Sanitation Services Act, 2015.

Lenders’ environmental and social guidelines such as the KfW Sustainability Guidelines and World Bank Environmental and Social Framework were also reviewed and incorporated in the assessment to ensure that implementation of the proposed project is in conformity with their environmental and social requirements. In particular, an assessment based on the KfW guidelines showed that the proposed project falls under **Category B** – most of the environmental and social impacts are local in nature and scope, and reversible, and only limited sections of affected persons’ lands will be required for infrastructure siting.

### **Baseline environment**

The environmental and social baseline information is fully presented in Chapter 5 of this report. It provides specific information within the Project’s area of influence which will be directly impacted (whether positively or negatively) by the project activities, as well as high regional baseline information to put the project into context.

Generally, the greater Githurai Area can be categorized as an urban, residential area, with some light commercial activities. It ranges from high density apartment blocks of low to medium class, and some medium and high class individual housing. Further away from the highway is currently less developed, with more vacant plots.

Towards the water abstraction point, there are farm lands mainly for tea and coffee plantations.

Due to anthropogenic factors mainly associated with urbanisation and agriculture, no habitats or species of conservation concern were identified within the project area.

### **Consultations and Public Participation**

A number of project stakeholders were identified consulted during the process of conducting the ESIA. The key outcomes of the stakeholders consulted are presented in the table below.

<b>S/No.</b>	<b>Aspect</b>	<b>Comments</b>
1.	Environmental and Safety Issues	<ul style="list-style-type: none"> <li>• The project will generate additional waste during the construction phase;</li> <li>• There will be noise from construction vehicles and machinery;</li> <li>• Soils will be exposed making them prone to erosion; and</li> </ul>

S/No.	Aspect	Comments
		<ul style="list-style-type: none"> <li>Adhere to Occupational Health and Safety, as well as Public Health standards to prevent accidents and ensure public safety.</li> </ul>
2.	Socio-Economic Issues	<ul style="list-style-type: none"> <li>The Contractor should give locals first priority for skilled and unskilled positions;</li> <li>Community will generate income from operating water kiosks;</li> <li>Community will generate income from supplying food to construction workers;</li> <li>Sanitation and hygiene will improve health standards;</li> <li>Increased agricultural productivity due to availability of water for irrigation;</li> <li>Reduced illegal connections to the main transmission pipe;</li> <li>Project will bring about economic development of the wider project area;</li> <li>Women who earn their living from roadside kiosks will be evacuated and their income source will be disrupted for a while;</li> <li>Traffic snarl up due to roadside construction works; and</li> <li>Interference with water supply during construction period.</li> </ul>
3.	Relocation Concerns	<ul style="list-style-type: none"> <li>The seedlings and flower traders in Ruiru, who are mostly women, expressed concern about displacement by the proposed project. They indicated that they would not find a suitable place to conduct business during the construction period. They requested to be adequately compensated;</li> <li>The community requested the consultants to ensure that all construction sites are appropriately restored to enable them to resume their business operations at the end of construction with ease;</li> <li>The shop owners emphasized the need for adequate compensation to enable them to cater for the loss of business during construction, and for the cost of reconstructing any damaged or destroyed stalls once construction ends;</li> <li>The locals requested for ample notice from the proponent to vacate the site prior to site clearance and preparation activities; and</li> <li>The community urged the proponent to adhere to construction timelines to minimize inconveniences during construction.</li> </ul>
4.	Project Design	<ul style="list-style-type: none"> <li>Some locals were of the opinion that areas under the coverage of the Nairobi Water and Sewerage Company supply should benefit from the proposed supply of RUJWASCO as opposed to phasing out the former; and</li> <li>In Kahawa Wendani, the community felt that the proposed project should have included a sewer line since waste water disposal is a challenge in the area.</li> </ul>

S/No.	Aspect	Comments
5.	Stakeholder Engagement	<ul style="list-style-type: none"> <li>The community advised that the Contractor should work closely with <i>nyumba kumi</i> structures at the grass roots level and the elders to enhance community project acceptability and for the safety of the project property.</li> </ul>

All the above issues from project stakeholders were incorporated in this ESIA study.

To ensure the conduct of appropriate post ESIA stakeholder consultation, concerns the stakeholders identified in during the conduct of this ESIA should be continuously engaged and updated of the project activities at all times. However, it is important to note that stakeholders are dynamic and may change during the course of project implementation; therefore, the stakeholders identified should be periodically reviewed and the list updated to remove stakeholders who will have become irrelevant to the project and add new ones who will have become relevant stakeholders.

### **Impact Assessment and Mitigation**

Implementation of the proposed project will be associated with both positive and negative impacts during both the construction and operation phase. The identified and assessed impacts are outlined below.

#### **Positive Impacts**

The proposed project aims at increasing water supply in the greater Githurai area which is a very major positive impact. Once completed, it will benefit the sub-locations of Kiuu, Mwiki, Kahawa Wendani, Kahawa Sukari, Mvihoko A and Mvihoko B. This will ensure supply of clean potable water to the residents of these areas where water demand is expected to continue increasing from the estimated 18,562 cubic metres per day in 2019 to the estimated 28,063 cubic metres per day in 2025.

In addition to this major positive impact, outlined below are the other positive impacts that will be associated with the implementation of the proposed project. These positive impacts will mainly be realised during the operational phase and these include:

- Impacts on employment, procurement and the economy;
- Improved accessibility to clean and reliable water supply;
- Improved hygiene in the project areas;
- Reduced cases of water related diseases;
- Reduced water and sanitation burden to women; and
- Increased land values in the project area.

#### **Negative Impacts - Construction Phase**

There are some negative impacts which will be associated with the construction phase of the proposed project. These are:

- Impacts on water quality;
- Impacts on local air quality;

- Impact of habitat loss and degradation;
- Impacts from noise and vibration;
- Impacts from wastes and effluents;
- Loss of agricultural land;
- Traffic impacts;
- Community health, safety and security;
- Labour and working conditions including workers' health and safety;
- Impacts on cultural heritage;
- Loss of business and income;
- Increased transmission of HIV/AIDS; and
- Disruption of public utilities.

### **Negative impacts - Operation Phase**

The operation phase will also be associated with some negative impacts. These include:

- Impact on River Ruiru surface flow;
- Impacts on water quality; and
- 
- Increased waste water generation in the Project Area due to improved water supply.

### **Climate Change Related Impacts**

In the long run, the proposed project once implemented will help the local community members to adapt to two climate change impacts. These are:

- Impacts of forecasted temperature increases; and
- Impacts of forecasted increase in precipitation.

However, the proposed project is likely to be affected by the impact of forecasted changes in the magnitude and frequency of extreme climatic events associated with climate change in the long run.

Finally, the proposed project will have a net neutral impact on greenhouse gas emissions.

### **Cumulative impacts**

There have been ongoing water and sanitation projects around Githurai area. These projects are aimed at improving the sanitation standards in the residential sections of this area, especially on sewage management. Though these projects also require land and working space, they are not proximal to the proposed infrastructure routing for the Project.

However, there is no specific development or Project proximal to the project footprint that has been made public or which has been made explicit in meetings with Stakeholders and/or County Authorities.

**Decommissioning phase impacts**

It is anticipated that the impacts associated with decommissioning will be similar to those encountered during construction.

However, as of now, decommissioning is not planned as the project is intended to continuously supply potable water to the priority areas. Despite this, situations in future which are not envisaged at the moment such as improved technology, change in land use and changes in the water regime may require that the project be decommissioned.



### **Mitigation measures for negative impacts**

For each of the negative impacts, a number of appropriate mitigation measures have been identified and recommended for implementation during project implementation. The mitigation measures are aimed at reducing the severity of the negative impacts to acceptable levels.

With the implementation of recommended mitigation measures, the ESIA consultant is convinced that all the negative impacts will be kept within manageable limits.

### **Enhancement measures for the positive impacts**

Measures to enhance the positive impacts have also been identified to maximise the project benefits. Once implemented; the positive impacts will supersede the negative impacts.

### **Environmental and Social Management and Monitoring Plan (ESMMP)**

All the recommended mitigation measures for the identified negative impacts and enhancement measures for the positive impacts have summarised the ESMMP with clear monitoring indicator for each of the impacts and responsibilities to ensure effective implementation and management of the impacts. The ESMMP contains a table where this information has been summarised as well as a brief description of the key responsible personnel.

It is expected that effective implementation of the ESMMP will maximise the project benefits whilst minimising all the associated negative impacts to acceptable levels.

### **Recommendations**

The implementation of the impact mitigation measures detailed in Chapter 6 and listed in the ESMMP (Chapter 7) will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the development are enhanced and mitigated respectively to a level which is deemed adequate for the development to proceed.

Based on the findings of this assessment, the study team recommends that the Project be authorised, contingent on the mitigations and monitoring for potential environmental and socio-economic impacts as outlined in the ESMMP.

# **1 INTRODUCTION**

## **1.1 PROJECT BACKGROUND**

The German Government through the cooperation area "Development of the Water and Sanitation Sector" together with the Kenyan Government has financed the "Nairobi Satellite Towns Water and Sanitation Development Programme" (NST-WSDP) to support the satellite towns that face large water supply deficits with chronic water shortages, water rationing, high prices paid to water vendors, time spent queuing for water and incidence of water borne diseases.

This programme kicked-off with a feasibility study conducted by the association, Gauff Ingenieure (JBG) and GFA Consulting Group. In this study, 68 project proposals in the satellite towns of Nairobi were identified and assessed. Out of these, 25 of the projects that build on existing investments (for example availability of water sources with no connection/ distribution network) were prioritized for development. Two of these projects have been selected for financing during the first project phase and there are:

1. Ruiru – Juja Water Supply Project (RJ01); and
2. Kiserian – Ongata Rongai Water Supply Project (OL01).

Athi Water Services Board (AWSB), the Project Executing Agency (PEA) on behalf of the Government of Kenya, is undertaking these projects. The objective of these projects is to provide sustainable access to potable water supply and sanitation services in urban and peri-urban areas in the satellite towns around Nairobi.

AWSB has engaged Ms. Posch & Partners Consulting Engineers and Ms. Norcken International Ltd (in a consortium) as the Technical Implementation Consultants (TIC) to carry out the detailed designs, tendering and construction supervision for the above described measures. This assignment includes the conduct of environmental and social impact assessments for the projects to ensure environmental and social compliance.

This study is specifically conducted for the Ruiru – Juja Water Supply Scheme, the Kiserian – Ongata Rongai Water Supply Project will be a subject of a separate study. Therefore, this Environmental and Social Impact Assessment (ESIA) report only covers the Ruiru – Juja Water Supply Scheme.

## **1.2 PROJECT JUSTIFICATION AND BENEFITS**

The Project Area is growing fast due to good transport connections to Nairobi and relatively cheaper accommodation. Greater Githurai can be categorized as an urban, residential area, with some light commercial activities. It ranges from high density apartment blocks of low to medium class, and some medium and high class individual housing. Further away from the highway is currently less developed, with more vacant plots.

The comparison of the development of the water demand and the available sources for the Project Area is shown in Table 1.1 below.

**Table 1.1 Water demand for the Project Area compared with available sources**

Water Demand per supply area	Projected water demand (m <sup>3</sup> /day) <sup>1</sup>						
	2019	2020	2021	2025	2028	2030	2035
Kahawa Sakuri	3,639	3,830	3,951	4,840	5,634	6,359	7,584
Kahawa Wendani	2,308	2,427	2,505	3,069	3,572	4,032	4,810
Kiuu A	5,364	5,643	5,822	7,130	8,302	9,371	11,178
Kiuu B	644	1,278	1,320	1,616	1,882	2,125	2,534
Mwiki	6,606	6,951	7,171	8,783	10,224	11,542	13,767
Mwikoho A	-	-	1,760	2,156	2,510	2,833	3,379
Mwikoho B	-	-	383	470	546	617	736
<b>Total (Greater Githurai Area)</b>	<b>18,562</b>	<b>20,130</b>	<b>22,912</b>	<b>28,063</b>	<b>32,670</b>	<b>36,879</b>	<b>43,988</b>

*Source: Draft Design Report, 21/12/2017*

According to the projected information, the water demand in the Project Area in 2019 will be 18,562 m<sup>3</sup>/day and this will have increased to 20,130 m<sup>3</sup>/day by 2020. Currently, water supply to the Project Area is by the Nairobi City Water and Sewerage Company (NCWSC). Information from NCWSC's metre readings indicate that between July and September 2016, an amount of 2,000 – 3,000 m<sup>3</sup> was supplied to the project area per week (not including part of Mwiki, which would be additional to this amount). This 2,000 to 3,000 m<sup>3</sup> is spread over the 4 days per week when water is supplied. More recent meter readings are not available and it is reported that reading of the meter is no longer done. However, it is also reported that in 2017 the amount of water supplied is likely to be less, because the dry spell experienced led to more rationing.

The current actual demand for water in the area supplied by NCWSC is estimated to be about 5,000 m<sup>3</sup>/day, hence less than 10% of the demand is covered by NCWSC and this is also not a continuous supply. Therefore, in order to meet the water demand for the project area, putting into consideration the projected water demand, an alternative project has to be implemented hence the decision to implement the Ruiru – Juja Water Supply Project.

The Project is a Social Uplifting Project (SUP) according to NEMA categorization with the following direct benefits estimated to be achieved:

- The Project shall lead to realization of AWSB strategic goals of improving water and sewerage coverage in AWSB area of jurisdiction. The plan intended to increase access to safe water in AWSB urban areas from 61% to 86% by 2017 while sewerage services were planned to be increased from 40% to 84% in 2017. The Project is among the initiatives of the board towards achieving the strategic goals above;
- Sustainable Development Goal (6) which is the new 2030 agenda and expands Millennium Development Goal as guided by resolutions of Rio+20 conference. The goal focuses more on investment in adequate

infrastructure in water sanitation, Hygiene, water quality, waste Water Management, water scarcity and use efficiency, integrated water resource management and protection of water related ecosystems;

- The project is a Vision 2030 related project which endeavours to contribute to improved water supply to the Greater Githurai Area;
- Millennium Development Goal 7: Ensuring Environmental Sustainability target of halving by 2015, the proportion of people without sustainable access to safe drinking water and sanitation services;
- Provision of access to improved water and sewerage services within the Greater Githurai Area;
- Provision of direct employment during the construction phase; and
- Enhance the social well-being of urban population as the environment is improved through improved water & sanitation services.

### **1.3**

#### **THE ESIA PROCESS**

In Kenya, the Environmental Management and Coordination Act (EMCA) of 1999 (and the 2015 amendments) and the Environmental (Impact Assessment and Audit) Regulations of June 2003 (and the 2016 amendments) define the legal basis for and the requirements of environmental impact assessment and management.

The second schedule in the amendments of the Environmental (Impact Assessment and Audit), 2016 lists water resources and infrastructure projects including water supply and distribution infrastructures under medium risk projects for which an ESIA is required. This ESIA report has, therefore, been prepared in line with the requirements of these regulations.

EMCA (1999) defines environmental impact assessment as a systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment. The EMCA (1999 and the 2015 amendments) and Environmental Regulations (2003 and the 2016 amendments) define different requirement for environmental impact assessment based on the sector, nature of the project and its likely environmental impacts. Specifically, a project proponent may be required to implement only an Environment Project Report (EPR) study or both an Environment Project Report (EPR) study and a detailed ESIA, the former being a precursor to the latter.

Where a detailed ESIA is deemed necessary, it is intended to establish and describe the baseline environmental and socio-economic conditions within the project areas, identify and analyse potential significant impacts associated with the proposed project, develop effective mitigation and management measures for the analysed risks and impacts, and submit an ESIA Study Report with this information to NEMA for review.

After the ESIA Study Report is submitted to NEMA, copies are sent to the relevant Lead Agencies for review. A Technical Committee then sits to review the report and either issues an Environmental Impact Assessment License,

declines to issue the license with reasons, or requests for more information or wider consultation.

#### **1.4 PURPOSE OF THIS ESIA STUDY REPORT**

The primary purpose of the ESIA study and this report is to identify the environmental and social sensitivities related to the project and conduct a detailed assessment of the potential risks and impacts on them from project infrastructure, activities and processes. The study was also conducted to ensure that the project complies with the Kenya's Environmental Management and Coordination Act (EMCA) and the Environmental (Impact Assessment and Audit) Regulations as well as lender requirements such as KfW Sustainability Guidelines.

The specific objectives of this ESIA Study Report are as follows:

- Provision of an overall assessment of the social and biophysical environment affected by the project;
- Identification and detailed assessment of potentially significant impacts associated with the project;
- Identification and recommendation of appropriate mitigation measures for potentially significant environmental and social impacts;
- Public/stakeholder consultations to ensure that the affected communities are engaged throughout the ESIA process and their issues and concerns addressed;
- Developing an Environmental and Social Management Plan necessary to minimize, mitigate any potential environmental impacts identified by the ESIA; and
- Preparation of an ESIA Study report in accordance with the requirements of the Environment (Impact Assessment and Audit) Regulations, 2003.

#### **1.5 ESIA ASSESSMENT METHODOLOGY**

The ESIA applied both qualitative and quantitative research methods to collect relevant data and information. A participatory approach that recognizes the importance of all stakeholders, and seeks to incorporate opinions and suggestions of all, especially the intended beneficiaries was adopted. The methodology comprised literature review, field visits and data collection from the project area, data analysis and report writing. The main tools applied included:

**Task 1:** Desk review of available literature which included:

- Water Supply Master Plan for Nairobi City and Satellite Towns 2012;
- Detailed Design Report for Greater Githurai / Ruiru Juja Water Supply System;
- Terms of Reference for Consulting Services for Design and Supervision of the Nairobi Satellite Towns Water and Sanitation Development Programme (NST-WSDP), Phase 1;
- Kiambu County Integrated Development Plan (CIDP) (2013 – 2017); and
- Relevant legal instrument both national and international

**Task 2:** Stakeholder and Community consultations:

Stakeholders were drawn from different areas of the project area including:

- Guthurai;
- Kimbo;
- Kahawa Sukari;
- Kahawa Wendani;
- Kiuu-Githurai;
- Mwioko;
- Ruiru; and
- Wendani.

The consultations were done through:

- Interviews with the Project Affected Persons (PAPs);
- Public meetings/*barazas*, and
- Focus Group Discussions (FGDs)..

**Task 3:** Identification of relevant government institutions and their responsibility in ensuring that the project is implemented within the current institutional framework including review of relevant legal and policy issues relevant to the Environmental and Social Safeguard Requirement by Government of Kenya.

**Task 4:** The task involved identification, collection and analysis of environmental baseline data, identification of impacts; analyses and evaluation of impacts; formulation of mitigation measures for significant negative impacts; development and analysis of project alternatives, and development of environmental/social management and monitoring plans.

## 1.6

### STUDY TEAM

The ESIA Study was conducted by the following Experts:

1. Haroub Ahmed- Lead EIA Expert
2. Eunice Opondo – Social Expert
3. Edward Mwangi- Assistant Environmental Expert

## 1.7

### STRUCTURE OF THIS REPORT

The structure of this report is as follows:

**Table 1.2** *Report Structure*

Chapter	Contents
Chapter 1 – Introduction	Presents a brief background to the proposed Project, Project rationale, the ESIA process and the purpose and structure of the report.
Chapter 2 – Project Description	Provides a brief overview of the proposed Project components.
Chapter 3 – Project Alternative	Discusses the Project alternatives that have been considered thus far in the ESIA process.

<b>Chapter</b>	<b>Contents</b>
Chapter 4 – Institutional and Legal Framework	Describes the legislative, policy and administrative requirements, as well as international best practice applicable to the proposed Project.
Chapter 5 –Baseline Environment	Provides a brief overview of the physical, biological and socio-economic characteristics of the Project Area.
Chapter 6 –Consultations and Public Participation	Summarises the consultation process during the ESIA, and provides the Stakeholder Engagement Plan for implementation during the life of the proposed Project.
Chapter 7 – Impact Assessment and Mitigation	Identified, describes and analyses the potential environmental and social impacts that have been identified during the study, and proposes mitigation measures to minimise the significances of the negative impacts.
Chapter 8 – Environmental and Social Management Plan	Outlines the programme established to Manage identified impacts, and to monitor the implementation of the key environmental and social issues in relation to the full range of environmental and social management requirements that apply to the Project.
Chapter 9 - Conclusions	Summarises the key findings of the study and the overall expert opinion of the ESIA study team.

## 2

## PROJECT DESCRIPTION

### 2.1

### INTRODUCTION

The Ruiru – Juja Water Supply Project aims at improving the supply of potable water in the Githurai Area from the Jacaranda water abstraction point. Based on the scenarios analysed as presented in detail in Section 2.3 of this report, an increase in water abstraction of 15,000 m<sup>3</sup>/day from the currently permitted 13,000m<sup>3</sup>/day to give a total of 28,000m<sup>3</sup>/day is proposed. More so, the capacity of the existing Jacaranda Water Treatment Plant (WTP) will be increased as well as construction of a new transfer mains from Jacaranda WTP to Ruiru (approximately 6.6 km), construction of a new transfer mains from Ruiru to Githurai (approximately 5.9 km), construction / extension of the distribution network (around 135 km) in Githurai Area, and installation of necessary consumer connections.

### 2.2

### PROJECT LOCATION

The Ruiru-Juja area lies north-east to Nairobi (Figure 2.1). Juja is situated in the northern, while the Greater Githurai Area is situated in the southern part of Ruiru Sub-County, Kiambu County. Presently Juja is served separately by Ndarugu WTP and the Greater Githurai area is partly and intermittently supplied by Nairobi City Water and Sewerage Company (NCWSC) WSP. Certain densely populated areas of Githurai are not covered by water supply, especially the urban poor who have no access to water services.

**Figure 2.1 Project Location**

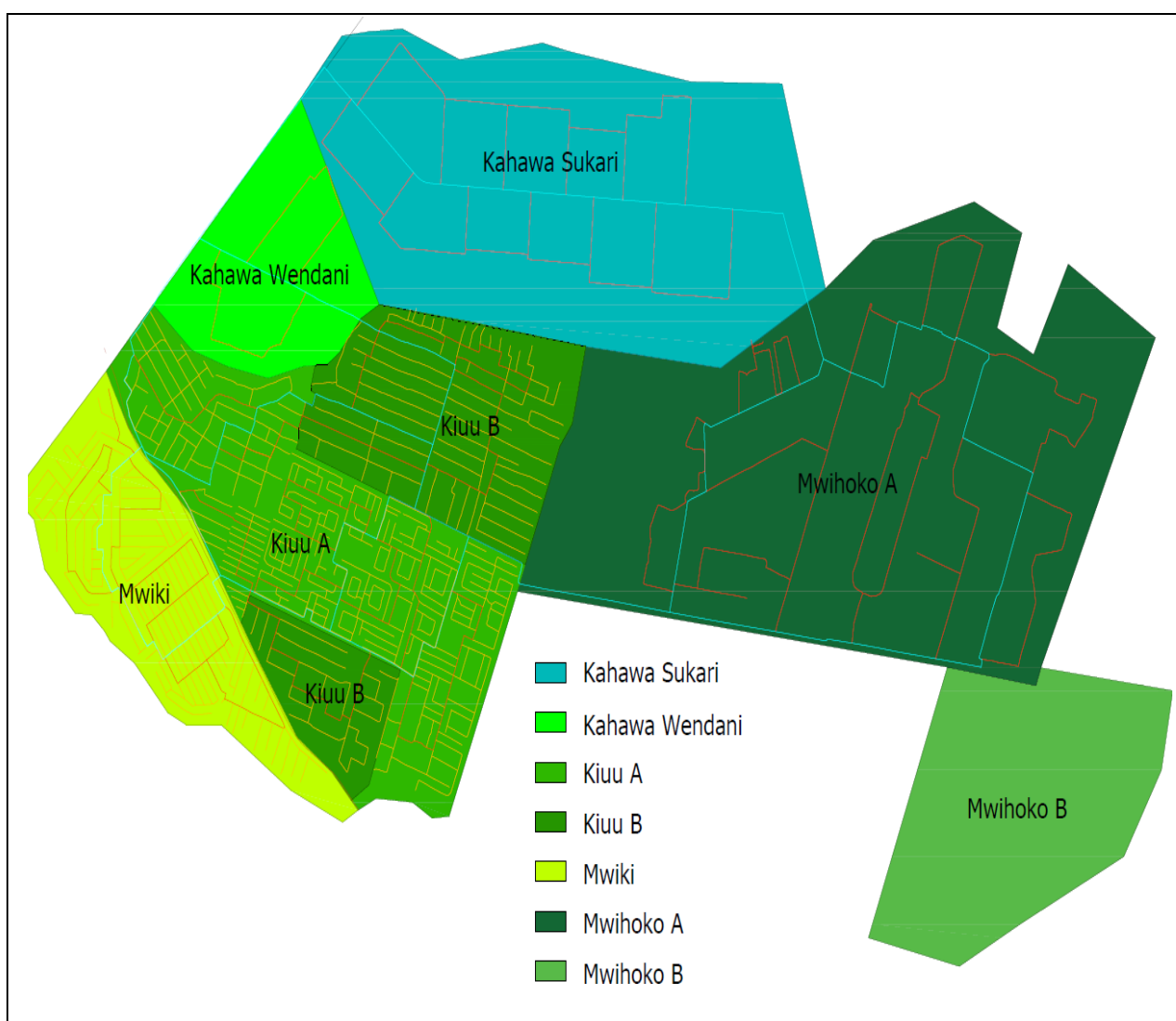




### 2.2.1 Project Area of Interest

The proposed Project is located in Ruiru and Juja which are Nairobi satellite towns, located directly adjacent to the Nairobi metropolitan area to the North East of Nairobi, in Kiambu County. The Water Service Provider for this area is Ruiru-Juja Water and Sewerage Company (RUJWASCO), with the head office in Ruiru. The project will construct a new distribution system in the Greater Githurai area, comprising the sub-locations of Kiuu, Mwiki, Kahawa Wendani, Kahawa Sukari, Mwhoko A and Mwhoko B, which are located within the service area of RUJWASCO, but not currently supplied by RUJWASCO. The Project Area has been zoned as presented in Figure 2.2.

**Figure 2.2** Project Area of Interest with names of main supply zones – basic inputs



### 2.3 PROJECT COMPONENTS: RUIRU-JUJA WATER SUPPLY PROJECT (RJ01)

Table 2.1 below summarises the features of the main Project components.

**Table 2.1 Main Project Components**

<b>Component</b>	<b>Proposed works</b>
Water source – Jacaranda Intake	<ul style="list-style-type: none"> <li>• Removal of existing raw water pumps from PS; and</li> <li>• Replacement with 4 vertical split case pumps, H=50, Q=583 (2 duty, 2 standby), incl. associated pipework and E&amp;M.</li> </ul>
Raw Water Pumping Main	Construction of a second raw water pumping main parallel to the existing, approximately 1 km long, OD 450 PN 10 HDPE.
Water treatment	Upgrading Jacaranda WTP from 15,000 m <sup>3</sup> /d to 28,000 m <sup>3</sup> /d by: <ul style="list-style-type: none"> <li>• Construct 2<sup>nd</sup> treatment line consisting of:               <ul style="list-style-type: none"> <li>○ Inlet structure;</li> <li>○ 2 No. Flocculation basins;</li> <li>○ 2 No. Sedimentation tanks;</li> <li>○ 4 No. Rapid Gravity Sand Filters; and</li> <li>○ Gravity Sludge Drying Beds.</li> </ul> </li> <li>• Additional Works:               <ul style="list-style-type: none"> <li>○ Replace Elevated Backwash Tank pumps to higher capacity for quicker filling of existing backwash tank;</li> <li>○ Install one additional backwash blower; and</li> <li>○ Construct additional chemical storage, mixing and dosing building for alum and soda ash dosing.</li> </ul> </li> </ul>
Transmission main	<ul style="list-style-type: none"> <li>• Construction of a dedicated 6.8 km DN 600 steel pipe from Jacaranda Water Treatment plant to Ruiru;</li> <li>• Installation of connection piece for future interconnection of Karimenu II transmission main; and</li> <li>• Construction of a dedicated 6.1 km DN 800 steel pipe from Ruiru to Githurai (Kahawa Sukari).</li> </ul>
Water distribution	Dependent on available budget, construct 168 km of ring mains and distribution network in Greater Githurai area of Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari (OD63 to DN800): <ul style="list-style-type: none"> <li>• 61.8 km – OD 63;</li> <li>• 31.3 km – OD 90;</li> <li>• 20.1 km – OD 110;</li> <li>• 15.8 km – OD 160;</li> <li>• 19.5 km – OD 225;</li> <li>• 10.1 km – OD 355;</li> <li>• 2.0 km – DN 400;</li> <li>• 4.4 km – DN 500;</li> <li>• 1.5 km – DN 600; and</li> <li>• 1.2 km – DN 800.</li> </ul>
Consumers	<ul style="list-style-type: none"> <li>• Supply and install 84 km OD 20 High-Density Polyethylene (HDPE) for consumer connections;</li> <li>• Supply and install 6,300 consumer water meters (DN 15 c/w box); and</li> <li>• Supply and install 2,100 consumer water meters (DN 25 c/w box).</li> </ul>
Equipment	Supply operation and maintenance equipment.

## 2.4

### LAYING AND INSTALLATION OF PIPES

The pipeline routing indicated in Figure 2.3 and Figure 2.4 has been determined on site on the basis of available wayleaves, the shortest route, access for works, O&M and minimum difficulties. However, the Contractor will be responsible for the final pipe positioning, following the excavation of trial pits to uncover existing services and obstructions, and liaison with the relevant service providers and authorities.

The pipe routing was selected during the design phase to minimise disruption by using available wayleaves and no private land is required to be acquired for

the works. An effort was made to avoid the most congested and busiest roads and market areas to reduce inconvenience to residents and resettlement issues.

The Contractor is generally free to propose alternative routings for the water supply system if he manages to find a more economical way, in which case he will have to submit detailed construction drawings including new quantities based on the units in the Bills of Quantities (BoQ) to the Consultant.

The Contractor will be responsible for a detailed condition survey along the pipeline route, to be approved by the Supervisor. Following installation of the pipe, reinstatement of all surfaces and facilities must be done as a minimum to the condition as prior to the works.

The proposed pipelines have been designed with as uniform a gradient as possible. Pipe laying must be as per EN 805, Water Supply requirements for systems and components outside buildings. Mains running parallel to or crossing foul or combined sewers should be located at higher levels, or if not possible, adequate precautions should be taken to preclude the ingress of contaminated water to the main.

Before pipes are laid, the trench shall be checked for correct depth, gradient, width and condition of the trench bottom. Trenches excavated for pipe laying should not be open for extended periods in advance of pipe laying and should be backfilled as soon as possible. It is essential that the sides of the trench are adequately supported during pipe laying. Trench widths should be as narrow as is practicable but not less than the pipe diameter plus 300mm to allow adequate sidefill to be placed.

Due to cost and environmental reasons, excavated material from trenches will be re-used as far as possible for bedding, surround and backfill.

Where rock is encountered, pipes are to be laid on imported granular bed and surround. The layer of selected excavated material above the granular surround will be compacted in layers. These procedures help minimize damage to pipe protection / coating and improve on drainage underneath the pipe.

The general considerations in determining the cover to the pipeline were as follows:

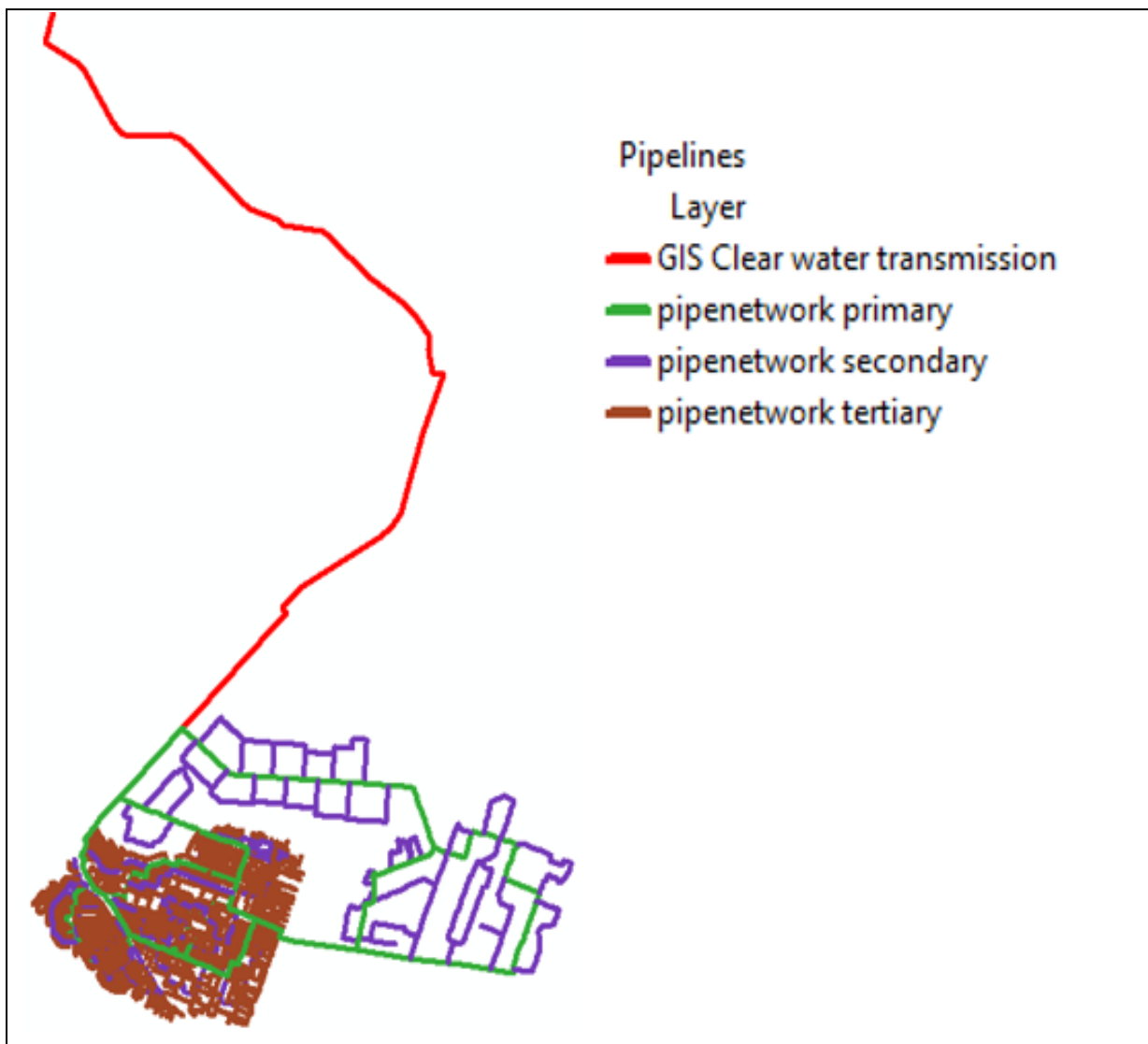
- External loadings from earth and superimposed loads (i.e., traffic and farm machinery);
- Utility conflicts;
- Future excavations for utilities; and
- Smooth pipeline grading to avoid the need for extra air valves and wash outs (where possible).

The minimum depth of cover of backfill has been taken as 0.9m above the crown of the pipe in road reserves and 1.2 m under roads. Concrete surround will be used to protect the pipe for major road crossings and in heavily trafficked areas.

The density of the pipe surround and backfill material will be regularly checked. In particular, several checks will be made during start-up of the project to ensure that the compaction procedure is achieving the desired density. Random checks will then subsequently be made to verify that the materials or procedures have not changed. Checks will be made at different elevations of the embedment material to assure that the desired compaction is being achieved throughout the embedment zone.

The final pipe route will be marked with posts or marker plates for pipe protection and maintenance. These will be provided at relevant locations, like gate valves, washouts, fire hydrants, etc. and along pipelines at every 200 to 400m, except where they follow permanent roads.

**Figure 2.3 Project Layout**



**Figure 2.4 Pipeline network with tertiary pipelines in priority areas (grey lines)**



## **2.5 POWER SUPPLY AND ELECTRIC WORKS**

The required power especially at the intake and water treatment plant will be supplied by the existing electricity connection within the Project Area. However, the following improvements will be made at the intake to ensure constant availability of the required electrical energy.

- Installation of a new power cable laying from transformer room to pump house;
- Installation of one standby diesel generator with 1,000 kVA capacity to allow uninterrupted WTP production during power outages; and
- Installation of a new pump control panel with Variable Frequency Drive, for pump starting and control.

## **2.6 WATER TREATMENT PLANT'S LABORATORY AND TEST**

There is an existing laboratory room at the existing Water treatment Plant (WTP), but it is lacking in furniture as well as apparatus and laboratory equipment, which are necessary for the process control and measuring of water parameters. Therefore, it is foreseen to consider supply of the minimum laboratory apparatus and furniture to enable operators to perform tests required for the optimum plant control and adjustment of the chemical dosing rate. The following test and measurements should be done by operators:

- **Jar test:** to find the best dosing rate of Alum and Soda Ash;

- **Turbidity meter:** Measuring of raw water, effluent of sedimentation and sand filter outlet for checking of online meter and system control;
- **pH meter:** Measuring of raw water, effluent of sedimentation and sand filter outlet for checking of online meter and system control;
- **Free Chlorine kit or meter:** Measuring of chlorinated water for checking of online meter and system control; and
- **Colour Portable Photometer:** Measuring of chlorinated water for system control.

## 2.7

### CROSSINGS

For road, rail and river crossings, standard designs and drawings have been prepared, which must be finalised by the Contractor prior to the works. These fall into the following categories:

#### 2.7.1 *River Under-crossings*

Under-crossings will be provided at river channels, streams and gullies provided that:

- Construction will be possible without major difficulties;
- Construction will not lead to serious environmental impacts of upstream and downstream environment;
- The soil structure is not susceptible to movements due to ground water and will not lead to flotation of pipeline;
- The water flow velocity on the river channel is not high; and
- The pipeline will be accessible for maintenance purposes i.e. draining of washouts.

The pipeline in under-crossings will be surrounded with mass concrete.

#### 2.7.2 *River Overcrossings*

The preferred design for pipeline crossings is for buried installation of pipeline. Overcrossings where required will be by pipeline supported on Reinforced Concrete Piers. Overcrossings will be provided in the following circumstances:

- Large river crossings where river diversion for an undercrossing would be expensive;
- Where pipeline construction below ground would be difficult to undertake due to slope stability;
- Rivers and streams with a steep channel slope leading to high velocity of flow;
- Situations where construction of an undercrossing will lead to serious environmental violations;
- Where the soil structure will not permit an undercrossing due to soil movements. Such situations, pier foundations will be driven to a solid rock; and
- For easy access to pipeline for maintenance and avoidance of unnecessary fittings for washouts and air valves or deep excavations.

Reinforced concrete piers will be used for Overcrossings. The pipeline will be supported on a support bracket and held into position by a mild steel strap tensioned through bolting.

The foundations for the piers will be anchored on a solid ground preferably rock. Where the rock depth is deep, support piles will be driven to a solid ground.

### **2.7.3 Road and Rail Crossings**

The pipeline route traverses a highly built up urban environment for much of its length and therefore numerous road crossings are inevitable.

For crossing of major paved roads, it is proposed to adopt Trenchless Road Crossing methods rather than open cutting and reinstatement of the roads. Use of Trenchless Technologies for crossing of major roads is a requirement by the Roads Authorities. Open cutting and reinstatement method will be used for crossing minor roads.

Trenchless crossing will also be used for the railway crossing at Ruiru Town, at chainage Ch 8+080.

The adopted method involves construction of a reinforced concrete tunnel with the crown of the tunnel located at least 1.2 m below the surface. The tunnel will be made up of 200 mm wide precast concrete segments arranged to form a lined micro-tunnel. The tunnel will have a rectangular cross section shape with an arched crown. The space between the precast concrete lining and the excavation will be grouted on completion of placing the segments.

## **2.8 STORMWATER CHANNELS**

The designed pipe routings, including consumer connections, will cross existing open storm water channels, which run alongside many roads. Different standard designs have been prepared for the different situations to be encountered; for example, size and depth of channel; material of channel construction; size and depth of water supply pipe crossing the channel. The selected method will be subject to approval by the Engineer during the construction works.

Stormwater channels are frequently heavily contaminated with solid waste, run off and sometimes wastewater, hence it will be important to protect the water pipes from cross-contamination.

Generally, the water pipes should be laid underneath the channel and protected from contamination either with a sleeve pipe or with concrete surround. For wider and deeper channels, particularly where crossed numerous times by consumer connections, an alternative will be to pass the pipe through the channel at a level higher than the channel bottom. This shall be done by pressing a steel sleeve pipe and using pipe spacers, with a minimum distance between channel / pipe bottom and protection pipe of 50 cm specified so that the channel does not become blocked.

## **2.9 WASTEWATER SYSTEM**

The only sewer system known about in the project area is the recently constructed Kiu River collector, which serves parts of Kahawa Sukari and Kahawa Wendani. The Contractor will be provided with the details of this system, but it is not expected that the information is completely reliable. In any case the Contractor must liaise with the relevant authorities and service providers and carry out site investigations to confirm the position of sewers and all other services on site. The pipe alignment must then be designed to take the

sewers into consideration. In general, the water supply pipes should always be laid above the sewer pipes, or, where this is not possible, the water pipes must be protected from cross-contamination with either a sleeve pipe or concrete surround. For all services a minimum distance of 0.3m should be maintained between the pipes and existing services.

## **2.10 SEPTIC TANKS**

It is expected that during the works, illegal septic tanks and soak-ways might be uncovered, which have been constructed outside the respective properties inside the road body or wayleaves. These will either need to be removed by the property owners, or the water main will have to be diverted past them, with protection installed to prevent contamination. These will be dealt with on a case by case basis, in conjunction with the respective authorities and the Engineer.

## **2.11 WATER TREATMENT PLANT CONTROL SYSTEM**

The plant is designed to be operated simply and reliably in manual mode with no PLC system, as per the existing plant. Also, there will be no Main Control Panel (MCC) and each unit will have its own local electric and control panel.

## **2.12 CONTRACTOR'S RESPONSIBILITIES DURING CONSTRUCTION OF WATER TREATMENT PLANT**

The Contractor shall have visited the project site before submitting the offer in order to assess onsite consistency and extent of work required, as well as the local operational and environmental constraints. The Contractor shall provide all labour, materials, equipment, tools and supervision necessary to undertake the works.

During the construction of the new and expanded WTP, the Works Contractor will have to maintain production in the existing plant as far as possible. Any interruptions in production from the existing plant must be notified in advance to RUJWASCO and the Engineer and agreed. If required, the Works Contractor will have to schedule any interruptions for during the night, to minimise inconvenience for consumers.

Where mechanical and electrical equipment is to be installed in existing facilities, the Contractor shall be responsible for protecting all existing plant, building works and services. Any damage caused by the Contractor to existing structures or services shall be repaired to the satisfaction of the Engineer. The Contractor shall immediately carry out essential repairs to any buildings, structures or services damaged by him during the execution of the Works and shall maintain them until such time as final reinstatement and repairs are completed.

The Works Contractor will also be responsible for implementing strict controls during the works to ensure no contamination of the water from the existing plant. The Contractor will only be permitted to proceed with works on the basis of Method Statements, approved by the Engineer.

Design drawings must be submitted to the Client / Engineer to obtain his approval before ordering of any Plant, after which rehabilitation / upgrading works will commence. As-built documents will be provided after completion of works.



Taking over will be carried out following the completion of testing, training and acceptance by the Engineer of the required documents, particularly O&M manuals and as-built drawings. Contractor's training must be based on the already approved O&M manuals and is subject to acceptance by the Engineer. Essential spare parts will also be supplied to RUJWASCO and contact details of suppliers will be given for non-essential spare parts. Training for the raw water pumping station and treatment plant will include a test run period, under the responsibility of the Contractor, supervised by the Engineer. RUJWASCO will be given sufficient notice of the recommended numbers of operators and their required experience, to ensure that the required staff are available for training.

## **2.13 PROJECT SCHEDULE AND WORKFORCE**

### **2.13.1 *Project Schedule***

The Project construction is expected to take at least 18 months, with a defects liability period of a further 12 months (Table 2.2)

**Table 2.3 Project Implementation Schedule**

Description Task		Year 1												Year 2												Year 3													
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
<b>1</b>	<b>Bidding and Award of Contract</b>																																						
1.1	Issue of Bids, Bid Evaluation and Award of Contract																																						
<b>2</b>	<b>Mobilization and Construction Period</b>																																						
	Mobilization																																						
	Supply of Pipes and Materials																																						
	Jacaranda WTP Works Section																																						
	Jacarada - Kahawa Sukari Transmission Main Works Section																																						
	Distribution System Works Section																																						
	Testing and Commissioning of Works																																						
<b>3</b>	<b>Defects Liability Period</b>																																						

Legend

	Main Task
	Sub Task
	Intermittent Activity

### **2.13.2 Workforce**

The number of personnel to be involved in the project is not clear at this stage. However, it will include categories of skilled, semi-skilled and unskilled labour.

### **2.14 HANDOVER STRATEGY**

Taking over will be carried out following the completion of testing, training and acceptance by the Engineer of the required documents, particularly O&M manuals and as-built drawings.

Pressure testing of the distribution system will be dependent on access to water. To facilitate this, it is proposed that RUJWASCO make water available from the existing Jacaranda WTP for testing completed parts of the new distribution system, once the new Jacaranda - Kahawa Sukari Transmission Main is completed. However, prior to this the Contractor will have to supply water in tankers for testing, because it will not be permitted for the Contractor to lay long lengths of pipes without testing.

Works sections will be taken over separately as indicated in the project implementation schedule. In addition, parts of the distribution will also be accepted for taking over of parts of the works, in line with the General Conditions of Contract, once entire District Metering Areas (DMAs) are completed.

For consumer connections, these shall be accepted for taking over of parts of the works only street wise or when entire "blocks" are completed. They can be accepted once they are pressure tested, but it must be noted that it will not be possible to actually connect consumers until there is a water source, i.e. until Jacaranda WTP is completed, 14 months from commencement.

The Engineer will check and approve the training provided by the Contractor for the O&M of the raw water pumping station, treatment plant, transmission mains and distribution system. This training will be based on the already approved O&M manuals and must include such items as emergency situations and repairs. Essential spare parts will be supplied to RUJWASCO and contact details of suppliers will be given for non-essential spare parts. Training for the raw water pumping station and treatment plant will include a test run period, under the responsibility of the Contractor, supervised by the Engineer. RUJWASCO will be given sufficient notice of the recommended numbers of operators and their required experience, to ensure that the required staff are available for training.

### **2.15 SOURCE OF FUNDING AND ESTIMATED COSTS**

#### **2.15.1 Source of Funding**

The overall budget for the Nairobi Satellite Towns Water and Sanitation Development Programme (NST-WSDP), Phase I, will be funded by a loan from KfW and the Government of Kenya (GoK); the proportions are indicated in Table 2.5 below.

**Table 2.4 Sources of funding**

Source	Percentage	Amount for Phase 1 <sup>1</sup> (excluding VAT, and any other taxes, charges or fees))
KfW loan	90%	Euro 28,000,000.00
GoK	10%	Euro 2,800,000.00
<b>Total</b>	<b>100%</b>	<b>Euro 30,800,000.00</b>

## 2.15.2

**Estimated costs**

The cost estimates from the Feasibility Study have been adapted for the revised investments and then cross-checked and updated by the Consultant, using costs from recent contracts and quotes from suppliers. These cost estimates will be further refined in parallel with completion of the tender documents and finalised with the Engineer's Confidential Cost Estimate.

Due to budget constraints (, water will only be distributed to the areas of Kiuu, Mwiki and Kahawa Wendani under this phase (Phase 1), leaving out the Kahawa Sukari area. Still with this plan, the budget will be exceeded by approximately 287,000 Euro; however, the estimated budget includes the 8,400 consumer connections, the same as foreseen in the FS, with total cost of 1.8 Mio Euro. The consumer connections include the supply of the water meters, which are proposed to be included in a separate supply contract thus slightly reducing the Project budget. Any other budget deficits could potentially be covered from the 10% contingencies, of 1.45 Mio Euro. The summary of the cost estimates for implementing the Project is presented in Table 2.5 below, excluding taxes.

**Table 2.5 Estimated Project implementation budget**

Description	Estimated Cost (in EUR) Option 2: Kiuu, Mwiki and Kahawa Wendani
<b>Water Treatment</b>	
13,000 m3/day expansion	1817000
<b>Subtotal for Water Treatment</b>	<b>1817000</b>
<b>Transmission Mains</b>	
Supply and install DN 800 Ruiru - Githurai, 5.9km	1914000
Supply and install DN 600 Jacaranda - Ruiru, 6.6km	2341000
<b>Subtotal for Transmission Mains</b>	<b>4255000</b>
<b>Distribution System</b>	
Supply of Kiuu, Mwiki and Kahawa Wendani, 131km of OD63 to DN800	5728203
<b>Subtotal Distribution System</b>	<b>5728203</b>
<b>Customer Connections</b>	
8400 Consumer Connections, OD20, including meter DN15 and DN25	1785000
<b>Subtotal Consumer Connections</b>	<b>1785000</b>
<b>O&amp;M Equipment</b>	
O&M Equipment	100000

<sup>1</sup> Phase 1 comprises of two projects namely Ruiru – Juja Water Supply Project (this Project) and Kiserian – Ongata Rongai Water Supply Project which will be a subject of a separate ESIA study. Therefore, this total budget of Euro 30,800,000.00 will be shared by the two projects. The current planning indicates that Euro 14,492,832 will be set aside for Ruiru – Juja Water Supply Project (this Project) and the rest, Euro 16,307,168 set aside for the Kiserian – Ongata Rongai Water Supply Project.

<b>Description</b>	<b>Estimated Cost (in EUR) Option 2: Kiuu, Mwiki and Kahawa Wendani</b>
<b>Subtotal O&amp;M Equipment</b>	<b>100000</b>
<b>Base Construction Costs (BCC)</b>	<b>13685203</b>
<b>Other Project Costs</b>	
<b>Contractors P&amp;Gs (8% of BCC)</b>	<b>1094816</b>
<b>Total (BCC and other project costs; not including contingencies)</b>	<b>14780019</b>

### 3

## PROJECT ALTERNATIVES

### 3.1

#### PROJECT PRIORITIZATION OPTIONS

The Project prioritisation was undertaken during the conduct of the Feasibility Study (FS) in 2014 by a different consultant. This has been re-evaluated during the preparation of the Detailed Design Report. During the FS conducted by a different consultant in 2014, all available investment proposals and identified other proposals were reviewed, in conjunction with AWSB, and the WSPs. Out of this process, a total of 68 project proposals in the satellite towns of Nairobi were identified and assessed. Based on a further analysis based on five main criteria; target area, overall water supply and sanitation situation, poverty reduction, cost efficiency and performance of the WSP, a total of 25 projects, dubbed "last mile investments" that build on existing investments (e.g. water sources available but no network) were prioritized for further studies and implementation. The Ruiru – Juja Water Supply Project (RJ01) is one of the two projects out of the 25 that have been selected for financing during the current first project phase.

### 3.2

#### COST ANALYSIS OF PROJECT ALTERNATIVES

Three Project alternatives have been analysed based on cost. Table 3.1 below presents a summary of the alternatives analysed which are further briefly described below.

**Table 3.1 Cost Based Project Alternatives**

Description	Estimated Cost (in EUR)		
	Option 1: Kiuu and Mwiki only	Option 2: Kiuu, Mwiki and Kahawa Wendani	Option 3: Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari
<b>Water Treatment</b>			
13,000 m3/day expansion	1817000	1817000	1817000
<b>Subtotal for Water Treatment</b>	<b>1817000</b>	<b>1817000</b>	<b>1817000</b>
<b>Transmission Mains</b>			
Supply and install DN 800 Ruiru - Githurai, 5.9km	1914000	1914000	1914000
Supply and install DN 600 Jacaranda - Ruiru, 6.6km	2341000	2341000	2341000
<b>Subtotal for Transmission Mains</b>	<b>4255000</b>	<b>4255000</b>	<b>4255000</b>
<b>Distribution System</b>			
Supply of Kiuu and Mwiki, 115km of OD63 to DN800	5057659		
Supply of Kiuu, Mwiki and Kahawa Wendani, 131km of OD63 to DN800		5728203	
Supply of Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari, 168km of OD63 to DN800			8092122

Description	Estimated Cost (in EUR)		
	Option 1: Kiuu and Mwiki only	Option 2: Kiuu, Mwiki and Kahawa Wendani	Option 3: Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari
<b>Subtotal Distribution System</b>	<b>5057659</b>	<b>5728203</b>	<b>8092122</b>
<b>Customer Connections</b>			
8400 Consumer Connections, OD20, including meter DN15 and DN25	1785000	1785000	1785000
<b>Subtotal Consumer Connections</b>	<b>1785000</b>	<b>1785000</b>	<b>1785000</b>
<b>O&amp;M Equipment</b>			
O&M Equipment	100000	100000	100000
<b>Subtotal O&amp;M Equipment</b>	<b>100000</b>	<b>100000</b>	<b>100000</b>
<b>Base Construction Costs (BCC)</b>	<b>13014659</b>	<b>13685203</b>	<b>16049122</b>
<b>Other Project Costs</b>			
<b>Contractors P&amp;Gs (8% of BCC)</b>	<b>1041173</b>	<b>1094816</b>	<b>1283930</b>
<b>Total (BCC and other project costs; not including contingencies)</b>	<b>14055832</b>	<b>14780019</b>	<b>17333052</b>

The above cost estimates include the 8,400 consumer connections, the same as foreseen in the FS, with total cost of 1.8 Mio Euro. This includes the supply of the water meter, which is proposed to be included in a separate supply contract and would thus slightly reduce the required budget.

**Option 1:** This option involves construction of the distribution system for the supply zones of Kiuu and Mwiki only and fits within the budget, with a saving of 437,000 Euro. The water demand for this option also best matches the 13,000 m<sup>3</sup>/day available from Jacaranda WTP and this was also the priority area for RUJWASCO, with the highest population density. However, this means that Kahawa Wendani and Kahawa Sukari would not be supplied by the new constructed system, so this would not achieve the project objective of RUJWASCO assuming responsibility for NCWSC's water provision services in the project area. This would mean either the existing network in Kahawa Wendani and Kahawa Sukari would need to be connected to the new transmission main, or supply would need to be maintained from Nairobi, with the risk of high Non-Revenue Water (NRW) and unauthorised interconnections of the old and new systems.

**Option 2:** This option involves construction of the distribution system for the supply zones of Kiuu, Mwiki and Kahawa Wendani zones. For this option, the the budget is exceeded by approximately 287,000 Euro; however, the estimated budget includes the 8,400 consumer connections, the same as foreseen in the FS, with total cost of 1.8 Mio Euro. The consumer connections include the supply of the water meters, which are proposed to be included in a separate supply contract thus slightly reducing the Project budget. Any other budget deficits could potentially be covered from the 10% contingencies, of 1.45 Mio Euro. However, still with this option, the estimated immediate water demand would not be fully covered.

**Option 3:** This option involves construction of the distribution system for the supply zones of Kiuu, Mwiki, Kahawa Wendani and Kahawa Sukari zones. This option would cover the estimated immediate water demand; however, it clearly exceeds the available budget, so does not seem feasible.

Therefore; Option 2 is the preferred option since it will supply most of the zones and within budget. Supply to the remaining Kahawa Sukari, and Mwhoko A and B should be considered under alternative funding.

### 3.3 ALTERNATIVE WATER SUPPLY PROJECTS

#### 3.3.1 The Karimenu 2 Dam Project

The Karimenu 2 Dam Project is another proposed water supply project that will supply an additional 47,000 m<sup>3</sup>/day to Ruiru-Juja via a new 20,000 m<sup>3</sup> capacity clear water tank that will be located at the site of Jacaranda WTP. This project is scheduled to be completed by the end of 2020, i.e. one year later than the Ruiru Juja Water Supply Project.

Waiting for the Karimenu 2 Dam Project would imply that the greater Githurai Area continue to suffer water shortages up to the end of 2020 (commissioning date not guaranteed) which is not desirable. However, to ensure complementally benefits, the design for the Ruiru Juja Water Supply Project has put into consideration the proposed Karimenu 2 Dam Project based on the projected water demand for the Project area.

Also, the Karimenu 2 project will terminate with transmission mains to Ruiru and Juja, so the proposed project is essential to distribute this additional water to consumers in Greater Githurai, who would otherwise not be able to benefit from the Karimenu 2 project.

#### 3.3.2 Supply by Nairobi City Water and Sewerage Company (NCWSC)

NCWSC supplies water to the project area via a DN 300 transmission main from Kasarani Reservoir and it is reported that pressure would be good; however, the valve on the outlet from the reservoir is usually throttled to reduce consumption. Because of this throttling the pressure is reduced. Water is only supplied in this transmission main 4 days per week, on Tuesdays, Wednesdays, Saturdays and Sundays. Parallel to this transmission main is another main which supplies Kenyatta University and this is supplied continuously. Table 3.2 presents the metre readings for the water supplied by NCWSC to the project area except for one DN 100 off-take that supplies a small area of Mwiki, which is not metered.

**Table 3.2 NCWSC Water supply to the Project Area**

Date	Meter Reading	Cumulative Amount (m3)	Number of Days	Average daily (m <sup>3</sup> )
07/06/2016	NOT READ			
05/07/2016	467,510			
11/07/2016	469,739	2,229	6	372
18/07/2016	471,897	2,158	7	308



Date	Meter Reading	Cumulative Amount (m3)	Number of Days	Average daily (m <sup>3</sup> )
25/07/2016	474,318	2,421	7	346
01/08/2016	476,760	2,442	7	349
08/08/2016	480,363	3,603	7	515
15/08/2016	482,742	2,379	7	340
22/08/2016	484,887	2,145	7	306
29/08/2016	487,809	2,922	7	417
31/08/2016	488,407	598	2	299
05/09/2016	490,318	1,911	5	382
12/09/2016	492,621	2,303	7	329
19/09/2016	494,923	2,302	7	329
26/09/2016	497,293	2,370	7	339
30/09/2016	498,649	1,356	4	339
03/10/2016	499,878	1,229	3	410
10/10/2016	501,992	2,114	7	302
18/10/2016	504,205	2,213	8	277
24/10/2016	506,295	2,090	6	348
31/10/2016	508,520	2,225	7	318
31/10/2016	508,520	0	0	
07/11/2016	510,620	2,100	7	300

*Source: NCWSC*

As can be seen in the table, between July and September 2016, an amount of 2,000 – 3,000 m<sup>3</sup> was supplied to the project area per week (not including part of Mwiki, which would be additional to this amount). This 2,000 to 3,000 m<sup>3</sup> is spread over the 4 days per week when water is supplied. More recent meter readings are not available and it is reported that reading of the meter is no longer done. However, it is also reported that in 2017 the amount of water supplied is likely to be less, because the dry spell experienced led to more rationing.

The current actual demand for water in the area supplied by NCWSC is estimated to be about 5,000m<sup>3</sup>/day, hence less than 10% of the demand is covered by NCWSC and this is also not a continuous supply. Therefore, in order to meet the water demand for the project area, an alternative project has to be implemented.

### **3.4 THE “NO PROJECT ALTERNATIVE” OPTION**

This “alternative” implies that the proposed project is put on hold and the current water supply situation be maintained. This would have far reaching negative implications on the target communities, businesses and individuals, and the environment, including:

- Inadequate water supply for domestic and industrial use;
- Poor sanitation and health risks due to continued use of water from the contaminated streams;
- Increased vulnerability of the poor sections of the population due to lack of adequate, clean, accessible water; and
- Failure to achieve the government’s commitments in the National Water Masterplan, and the Programme objectives.

This being the case then, "No Project Alternative" is discarded in favour of the Preferred Alternative which will lead to realisation of the project objectives which are for the good of the public.

This section describes the relevant legal and institutional framework relevant for the implementation of the Ruiru – Juja Water Supply Project. More so, the relevant lenders' requirements as well as best industry standards are also discussed in this section.

#### **4.1 POLICY PROVISIONS**

##### **4.1.1 Vision 2030**

Vision 2030 is Kenya's long –term development blueprint which aims to create a globally competitive and prosperous country providing a high quality of life for all its citizens. It is built of four pillars of economic, social, political, and enablers and macro foundations. Under the social pillar, it aims at ensuring a just and cohesive society enjoying equitable social development in a clean and secure environment.

This water project will contribute towards achieving the social goal by increasing access to clean potable water.

##### **4.1.2 Session Paper No.10 of 2014 on the National Environment Policy, 2014**

This Session Paper recognises that the survival and socio-economic wellbeing of Kenyans is ultimately intertwined with the environment. It therefore aims at ensuring better quality of life for present and future generations through sustainable management and use of the environment and natural resources. Specifically, policy statement number 3 of section 2.4 (Freshwater and wetland ecosystems) calls for promotion of sustainable use of freshwater and wetland resources and the conservation of river and lake ecosystems through development and implementation of river basin management plans.

##### **Relevance**

Water supply from the Ruiru – Juja Water Supply Project should be sustainable to guarantee long lasting benefits.

##### **4.1.3 National Water Policy**

The National Water Policy of Kenya was developed in 1999 as the National Policy on Water Resources Management and Development (NWP 1999) and it is effective at present. It aims at achieving sustainable development and management of the water sector by providing a framework in which the desired targets/goals are set, outlining the necessary measures to guide the entire range of actions and to synchronise all water-related activities and sectors.

The NWP, 1999, set the following specific policy objectives covering the four basic areas of water resources management, water supply and sewerage development, institutional arrangement and financing of water sector:

- Preserve, conserve and protect all available water resources and allocate it in a sustainable, rational and economical way;
- Supply of water of good quality and in sufficient quantities to meet the various water needs including poverty alleviation, while ensuring safe disposal of wastewater and environmental protection;
- Establish an efficient and effective institutional framework to achieve a systematic development and management of water sector; and
- Develop a sound and sustainable financing system for effective water resources management, water supply and sanitation development.

### **Relevance**

The Project will contribute towards the achievement of the first two policy objectives.

## **4.2**

### **NATIONAL LEGAL FRAMEWORK**

#### **4.2.1 The Constitution of Kenya**

In the Constitution of Kenya, 2010 Part II (Environment and Natural Resources), the State clearly undertakes to carry out the following:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- Eliminate processes and activities that are likely to endanger the environment; and
- Utilize the environment and natural resources for the benefit of the people of Kenya.

(II) "Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Chapter 5 on Land and Environment emphasizes the following:

- Land use and management shall by law benefit local communities;
- Community land is protected from encroachment by State;
- Rivers, forests and water bodies shall be protected by law;
- Equitable access to land;
- All lawful land rights are secured;
- County governments will manage public land in trust of the people in accordance with the Proposed Constitution.

## **Relevance**

The constitution of Kenya provides for ecologically sound resource use and management and social-economically sustainable development of projects in Kenya. This project is, therefore guided by these provisions and shall be undertaken to achieve the outlined objectives.

### **4.2.2 The Environment Management and Coordination Act, 1999 (and the amendments of 2015)**

The Environment Management and Coordination Act (EMCA) provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High Court if this right has been, is likely to be or is being contravened.

Section 58 of the Act makes it a mandatory requirement for an EIA study to be carried out by proponents intending to implement projects specified in the second schedule of the Act. Such projects have a potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.

## **Relevance**

The proposed project is listed in the second schedule of EMCA, under the list of projects that require an EIA study. It is on this basis that the ESIA studies were undertaken and this ESIA Study Report prepared for submission to NEMA.

The EMCA also provides for the development of several subsidiary legislations/ regulations and guidelines to streamline environmental management during Project implementation. Provided below is a description of key regulations and guidelines applicable to the Ruiru – Juja Water Supply Project.

### *Environmental Impact Assessment and Audit Regulations, 2003 and the amendments made in 2016*

The Environmental Impact Assessment and Audit Regulations state in Regulation 3 that "the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act. Part III of the Regulations indicates the procedures to be taken during the preparation, submission and approval of the ESIA Report, i.e., this Report. Specifically, the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2016 contains an updated copy of the Second Schedule in which the proposed project falls in the category of medium risk projects, specifically, Water resources and infrastructure including water supply and distribution infrastructures, for which an EIA is required.

## **Relevance**

In line with the requirements of these regulations, this ESIA Study Report has been prepared for review and approval by NEMA before the proposed project activities are undertaken. Once approved by NEMA, the Project Developer will be required to implement the recommendations and mitigation measures presented in this ESIA Study Report as well as recommendations made by NEMA.

*The Environmental Management and Co-ordination (Water Quality) Regulations, 2006)*

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29<sup>th</sup> September, 2006. The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution. Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

### **Relevance**

During the construction, maintenance and operation phases, the project will require adequate safeguards and constant monitoring in order to ensure that there is no pollution of any surface or subsurface water bodies; including the water that will be supplied by this Project.

*The Environmental Management and Co-ordination (Waste Management) Regulations, 2006*

These Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29<sup>th</sup> September, 2006. The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- domestic waste;
- industrial waste;
- hazardous and toxic waste;
- pesticides and toxic substances;
- biomedical wastes; and
- Radioactive waste.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Regulation 5 (1) provides categories of

cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

### **Improvement of production process through**

- Conserving raw materials and energy;
- Eliminating the use of toxic raw materials and wastes;
- Reducing toxic emissions and wastes.

### **Monitoring the product cycle from beginning to end by**

- Identifying and eliminating potential negative impacts of the product;
- Enabling the recovery and re-use of the product where possible, and
- Reclamation and recycling and
- Incorporating environmental concerns in the design and disposal of a product.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment. Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

### **Relevance**

The Project, during both construction and operational phases, will generate wastes which will need to be managed in accordance with these regulations. Waste minimisation will be given due priority, especially during construction. Wastes generated during both phases will need to be managed prudently by reusing or recycling where possible, and safe disposal to licensed waste management facilities in cases where wastes are to be disposed of.

*The Environmental Management and Coordination Act (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009*

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following:

- i. Prohibition of excessive noise and vibration;
- ii. Provisions relating to noise from certain sources;
- iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
- iv. Noise and excessive vibrations mapping.

According to regulation 3 (1), no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort,

repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

Regulation 12 (1) makes it an offence for any person to operate a motor vehicle which- (a) produces any loud and unusual sound; and (b) exceeds 84 dB(A) when accelerating. According to sub-regulation 2 of this regulation, No person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident. Regulation 13 (1) provides that except for the purposes specified in sub-Regulation (2) there under, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations

Regulation 19 (1) prohibits any person to carry out activities relating to fireworks, demolitions, firing ranges or specific heavy industry without a valid permit issued by the Authority. According to sub-regulation 4, such permit shall be valid for a period not exceeding three months.

### **Relevance**

The contractor /sub-contractor for civil works will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the construction phase due to the sensitivity of the Project Area which is highly populated. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting of vehicles.

Ensure that the noise levels as a result of the construction process does not exceed NEMA`s permissible limits of;

Day: 6:01 a.m. – 6:00 p.m. (Leq, 14 h)

Night: 6:01 p.m. – 6:00 a.m. (Leq, 14 h)

### **4.2.3 The Water Act, 2016**

The Water Act 2016 provides for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes. Section 21 of this Act provides for national monitoring and geo referenced information systems on water resources. Following on this, sub-Section 2 mandates the Water Resources Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to the authority.



Section 36 (a) makes it a requirement to obtain a water use permit for any use of water from a water resource with the exceptions of the exemptions listed in Section 37 of this Act. The Ruiru – Juja Water Supply Project does not fall under the exempted project and therefore requires a water use permit.

Section 63 of this Act makes it a right of every person in Kenya to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution.

Section 107 (1) states that a licensee may construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

Section 143 of the Act also makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

## **Relevance**

The Project is achieving one of the objectives of this Act, to promote the rights of individuals to have safe and adequate water. Once the project is implemented, the relevant water and sewerage companies will be required to take over management of the water supply and infrastructure to maintain the service provision to the targeted needy population. During construction, the project will be required to continuously reduce the silt and solid waste load from earthworks into nearby streams and other water bodies. Further the project is required to avoid any other contamination of water bodies and avoid activities in the riparian zones during the construction period.

RUJWASCO in liaison with the Proponent will apply for a variation license to increase the permitted volume of abstracted water from 13,000 m<sup>3</sup>/day to 28,000 m<sup>3</sup>/day.

*Water (Services Regulatory) Rules, 2012*

These rules set out the procedures for obtaining water use permits and the conditions placed on permit holders. Section 26(1) focusses on the supply of water in bulk and states that "*Each licensee shall develop water harvesting, abstraction, storage, treatment, and transmission facilities to supply water in bulk to its agents, other licensees or other users as prescribed in the license, and charge them appropriately.*"

Section 26(6) further indicates that the supply of water in bulk agreement shall be entered into in accordance with the requirements of the relevant sections of the Act (Water Act) and shall include:

- standard of quality of the water to be supplied;
- continuity of water supply or hours of water supply;
- maintenance of adequate reserves of water by the bulk supplier;

- tariffs to be paid by the purchaser for the bulk supply; and
- any other financial arrangements.

### **Relevance**

Supply of water from the Project will need to comply with the requirements of the Water Rules.

#### **4.2.4 The Public Health Act (Cap. 242)**

This is an Act of Parliament to make provision for securing and maintaining health. Of all the statutes, this Act can be considered to be the most comprehensive in dealing with aspects related to water and sanitation. As indicated in section 126- especially Rules stipulated under the Title: Public Health Drainage and Latrines) Rules.

The Municipal Councils may be reported to the Central Board of Health if they fail to perform duties to protect public health (Section 14/15). These duties include providing for the free flow of storm water drainage. Public Health officers work together with officers of Municipal Councils to protect public health.

Part IX Sections 115-126D deals with sanitation and housing. Any action injurious to health is classified as a nuisance.

According to Section 118 of the Act, it is the duty of every local authority to curb nuisances, and, to take measures for maintaining clean and sanitary conditions; and take proceedings against persons breaching these measures.

### **Relevance**

Part of the objectives of this Project is to reduce water-related sanitation risks to the target areas. By supplying clean, reliable water, there will be reduced risks to public health from drinking water, food handling, toilets and latrines access etc.

#### **4.2.5 Employment Act, 2007**

This is an Act of parliament that applies to all employees employed by any employer under a contract of service. It requires that employee recruitment, contract and grievance management, disciplinary measures and retrenchment and termination of service should be rational, fair and just. Employment of children in the following forms is also prohibited in the following sections of the Act:

*53. (1) notwithstanding any provision of any written law, no person shall employ a child in any activity which constitutes worst form of child labour.*

*56. (1) No person shall employ a child who has not attained the age of thirteen years whether gainfully or otherwise in any undertaking.*

*(2) A child of between thirteen years of age and sixteen years of age may be employed to perform light work which is:*

*(a) Not likely to be harmful to the child's health or development; and*

*(b) Not such as to prejudice the child's attendance at school, his participation in vocational orientation or training programmes approved by Minister or his capacity to benefit from the instructions received.*

### **Relevance**

The contractor will need to follow the requirements of the Act during employment, especially by being just and fair on recruitment, contract management, remuneration, and termination of service, as they are straight forward.

#### **4.2.6 Work Injury Benefits Act (WIBA)**

It is an act of Parliament to provide for compensation to workmen for injuries suffered in the course of their employment.

It outlines the following:

- Employer's liability for compensation for death or incapacity resulting from accident;
- Compensation in fatal cases;
- Compensation in case of permanent partial incapacity;
- Compensation in case of temporary incapacity;
- Persons entitled to compensation and methods of calculating the earnings;
- No compensation shall be payable under this Act in respect of any incapacity or death resulting from a deliberate self-injury;
- Notice of an accident, causing injury to a workman, of such a nature as would entitle him for compensation shall be given in the prescribed form to the director.

### **Relevance**

The contractor will need to abide by all the provisions of WIBA.

#### **4.2.7 The Occupational Safety and Health Act, 2007**

This is an Act of Parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes.

It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of this Act is to:

- Secure the safety, health and welfare of persons at work;
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Occupational Safety and Health Act 2007 (OSHA 2007) Kenya Gazette Supplement No. 111 (Acts No.15) dated October 26, 2007 revokes the Factories and Other Places of Work Cap.514.

The scope of OSHA 2007 has been expanded to cover all workplaces including offices, schools, academic institutions, factories and plantations. It establishes codes of practices to be approved and issued by the Directorate of Occupational Safety and Health Services (DOSHS) for practical guidance of the various provisions of the Act.

### **Relevance**

The contractor will be required to comply with all the provisions of the Act throughout the project cycle.

#### **4.2.8 The Land Act, 2012 and the 2016 Amendments**

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes. It repealed the Way leaves Act, Cap. 292; and the Land Acquisition Act, Cap. 295.

The Act identifies the following forms of land tenure:

- a. Freehold;
- b. Leasehold;
- c. Such forms of partial interest as may be defined under this Act and other law, including but not limited to easements; and
- d. Customary land rights, where consistent with the Constitution.

The Act outlines methods of acquisition of title to land, which include: (a) allocation; (b) land adjudication process; (c) compulsory acquisition; (d) prescription; (e) settlement programs; (f) transmissions; (g) transfers; (h) long term leases exceeding twenty-one years created out of private land; or (i) any other manner prescribed in an Act of Parliament.

Section 9 of this Act gives provision for conversion of land from one category to another in accordance with the provisions of this Act or any other written law. Section 9 (2) (c) outlines ways in which private land may be converted to public land, this may be through:

- i. Compulsory acquisition;
- ii. Reversion of leasehold interest to Government after the expiry of a lease; and
- iii. Transfers; or
- iv. Surrender

## **Relevance**

Based on the current planning, land acquisition is not anticipated since the Jacaranda area is already owned by the Proponent and the supply and distribution pipelines will be laid within the road reserves. However, in the event modifications are made to the design resulting in need for land acquisition, it should be acquired in line with the provisions of this Act.

### **4.2.9 Kiambu County Water and Sanitation Services Act, 2015**

This is an Act of the County Assembly of Kiambu to provide for development, regulation and management of county public works related to water and sanitation services, storm water management systems and water conservation and for connected purposes. Section 4 of this Act provides for the establishment of two water service providers within the county who will be responsible for the currently operating water service companies.

Section 25(1) requires a person intending to carry out or maintain any water works to apply for a permit from the relevant Department in the county. Section 27 further states that the executive member shall prescribe the appropriate conditions related to equipment and technology, design, construction, operation and maintenance of water works.

## **Relevance**

The Project Proponent will obtain a permit from the County government of Kiambu. In addition, the Project Proponent in liaison with the contractor will ensure that equipment and technology to be used, project design, construction, operation and maintenance of water works are acceptable to the county government of Kiambu.

## **4.3 THE INSTITUTIONAL FRAMEWORK**

In 2001, the Government established the administrative structures to implement the Environmental Management and Co-ordination Act 1999. These administrative structures were further updated following the enactment of the 2010 constitution and subsequent enactments and amendments of the relevant Acts. The main administrative structures relevant to the Ruiru – Juja Water Supply Project are described in the following sections.

### **4.3.1 County Government of Kiambu**

The county government of Kiambu is run by the governor and legislation for the county made by the county assembly. The county government is responsible for formulating county policies and acts to manage the county`s development with due consideration to a safe environment.

The Project Proponent should keep ongoing consultations with the County Government of Kiambu and ensure that the project works in collaboration with the county government to ensure that the project is in line with its policies and regulations.

### **4.3.2 The National Environment Management Authority (NEMA)**

The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment.

#### *Standards and Enforcement Review Committee (SERC)*

EMCA provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

#### *Public Complaints Committee*

EMCA has also established a Public Complaints Committee, which provides the administrative mechanism for addressing environmental harm. The Committee has the mandate to investigate complaints relating to environmental damage and degradation. The members of the Public Complaints Committee include representatives from the Law Society of Kenya, NGOs and the business community.

#### *County Environmental Committees*

County Environmental Committees also contribute to decentralised environmental management and enable the participation of local communities. These environmental committees will be restructured since different counties will need to address their county's environmental issues.

### **4.3.3 Institutional Structure of the Water Sector**

The National Policy on Water Resources Management and Development and the Water Act 2016, presently guides water resources management. The overall goal of the national water development policy is to facilitate the provision of water in sufficient quantity and quality and within a reasonable distance to meet all competing uses in a sustainable, rational and economical way.

The Ministry of Water and Irrigation is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses. The Ministry executes its mandate through the following sector institutions:

#### *Water Services Regulatory Board (WASREB)*

The regulatory Board is responsible for the regulation of the water and sewerage services in partnership with the people of Kenya. The mandate of the regulator covers the following key areas:

- Regulating the provision of water and sewerage services including licensing, quality assurance, and issuance of guidelines for tariffs, prices and disputes resolution;

- Overseeing the implementation of policies and strategies relating to provision of water services licensing of Water Services Boards and approving their appointed Water Services Providers;
- Monitoring the performance of the Water Services Boards and Water Services Providers;
- Establish the procedure of customer complaints;
- Inform the public on the sector performance; and
- Gives advice to the Minister in charge of water affairs.

#### *Water Resources Authority (WRA)*

WRA is responsible for sustainable management of the Nations Water Resources through:

- Implementation of policies and strategies relating to management of water resources;
- Development of principles, guidelines and procedures for the allocation of water;
- Development of Catchments level management strategies including appointment of catchments area advisory committees;
- Regulate and protect water resources quality from adverse impact; and
- 4. Classify, monitor and allocate water resources.

#### *Water Sector Trust Fund (WSTF)*

This body assists in the financing of the provision of Water Services to areas of Kenya which are without adequate water services. This includes providing financing support to improved water services towards:

- Capital investment to community water schemes in underserved areas;
- Capacity building activities and initiative among communities;
- Water services activities outlined in the Water Services Strategic Plan as prioritized by the Government;
- Awareness creation and information dissemination regarding community management of water services; and
- Active community participation in the management of water service.

#### *Water Services Boards (WSBs)*

The WSBs are responsible for the efficient and economical provision of water and sewerage services in their areas of jurisdiction. Athi Water Service Board is among the seven catchment Boards established under the Water Act, 2016 and is mandated to:

- Develop the facilities, prepare business plans and performance targets; and
- Planning for efficient and economical provision of water and sewerage services within their areas of jurisdiction.

#### *Water Services Providers*

Water Service Providers are the utilities or water companies. They are state owned but have been commercialized to improve performance and run like business within a context of efficiency, operational and financial autonomy, accountability and strategic, but minor investment.

#### *Water Tribunal*

The water tribunal is established to resolve water related disputes. In particular,

the Tribunal responsible for hearing and determining appeals at the instance of any person or institution directly affected by the decision or order of the Cabinet Secretary for the Ministry of Water and Irrigation, the WRA and Regulatory Board or of any person acting under the authority of the Cabinet Secretary, the Authority and Regulatory Board.

In addition, the Tribunal have the power to hear and determine any dispute concerning water resources or water services where there is a business contract, unless the parties have otherwise agreed to an alternative dispute resolution mechanism.

#### **4.3.4 Sectoral Integration**

This integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non- governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the Act.

Other stakeholder authorities include Ministry of Environment and Forestry, Ministry of Health, Ministry of Devolution and Arid and Semi-Arid Lands (ASAL), Ministry of Lands, Ministry of Water and Sanitation, Ministry of Labour and Social Protection as well as the County Governments. Others are the RUJWASCO and NWSC as well as key groups working with the beneficiary communities in the respective areas.

#### **4.3.5 Project Implementation Institutional Structure**

Athi Water Services Board has an established implementation system that has clear provisions for environmental and social integration through the Environmental unit. An ideal project management structure proposed for the organization in this project has the following components:

##### *The Contractor*

The contractor will be required to establish an environmental office to continuously advise on environmental components of the project implementation. Elements in the environmental and social management plan are expected to be integrated in the project with appropriate consultations with AWSB through the supervising environmental expert. The environmental officer of the contractor is also expected to fully understand the engineering and management aspects of the project for effective coordination of relevant issues.

##### *The Supervisor*

The supervisor will be engaged by AWSB (as the project proponent) to ensure effective implementation of the Environmental and Social Management Plan (ESMP). It is expected that supervisor engages the services of an environmental expert who should in return understand the details of the recommendations on environment management and especially the proposed action plans, timeframes and expected targets of the ESMP. The environmental supervisor expert should also be the liaison person between the contractor and AWSB on the



implementation of environmental concerns as well as issues of social nature associated with the Project.

#### *Environmental Management Section (AWSB)*

This Section was established within the Service Board to facilitate compliance of water projects with appropriate environmental regulations. The office is expected to advise the projects on environmental compliance and also provide a direct liaison with NEMA. Reports on the project implementation should reach this office directly from the Contractor and stakeholders or through the supervisor while on the other hand, NEMA and other environmental stakeholder are expected to raise environmental issues related to the project through the same office. The office, therefore, is expected to be well informed of all project related issues at all times during the implementation and operations.

## **4.4 KfW SUSTAINABILITY GUIDELINE, 2016**

KfW has set forth the environmental and social guiding principles that govern its operations and investments with a view to contributing to sustainable development aligned with the sustainability strategy of the German Federal Government. Through the guideline, seeks to ensure that Environmental and Social Impact Assessments (ESIA) are carried out for all relevant investments and projects in emerging markets and developing countries to assess the risks or negative impacts an investment, project or programme may have on the physical, biological and social environment and to determine measures together with the project partner or business client for avoiding, mitigating or offsetting such undesired effects.

The Guidelines point out that ESIA and climate change assessments are a core element of the assessment procedure of KfW Development Bank. They are, first and foremost, intended as a management tool to steer and shape projects over their entire life cycle (i.e. from planning to completion). The essential steps of an ESIA and climate change assessment include:

- a preliminary appraisal, called screening, to determine the environmental, climate and social relevance of a project;
- if the project has been found to be environmentally and/or socially relevant the definition of the assessment scope (scoping), in close cooperation with the executing agency, in order to identify and assess the project's environmental, climate and social consequences and risks more accurately; and
- the design and implementation of an environmental and social impact study (ESIS), climate change adaptation assessment and/or climate change mitigation assessment in order to examine all or individual aspects of the project, including participatory approaches to involve affected local groups and keep the public in the partner country informed.

### **4.4.1 Screening and Classification of Projects**

As part of the screening process, the planned projects will be appraised at an early stage in order to determine its relevance in terms of environmental and social aspects and risks, as well as in terms of substantial greenhouse gas

reduction potential and substantial need of adaptation to possible climate change. The screening process is designed to identify and appraise the type and scale of any negative consequences or risks that may arise, potentials for reducing greenhouse gas emissions and possible climate change impacts on the project that may impair the achievement of objectives.

The next step, once the relevance of such consequences or risks has been established, is to define the type and scope of additional studies which need to be conducted as part of project preparations. All projects will be classified into one of the following three categories A, B or C, according to the relevance of their potentially negative environmental and social impact.

**Category A** – Projects may have a severe negative impact (manifold, irreversible or unprecedented) on the environment and/or the social conditions of those concerned. Such consequences may affect a larger area beyond the site of the facility under construction, the site of the facility itself or the project area in a narrower sense. As a matter of principle, any projects that are considered sensitive must be classified as category A; this applies to Projects which may, for example;

- affect important protected habitats or sites (tropical forests, coral reefs, nature reserves, wetlands, historic cultural sites etc.);
- violate international treaties (such as conventions on international waste management regulations or on marine conservation);
- lead to a high consumption of resources, and of large areas of land or large quantities of water in particular;
- constitute a major hazard to human health (e.g. facilities located in residential areas or handling hazardous substances; noise pollution or harmful emissions); or
- require the resettlement of a large number of people.

For category A projects, it is mandatory to analyse and appraise any negative ecological and social consequences as part of an independent environmental and social impact study (ESIS) and to draw up an environmental and social management plan (ESMP). The ESMP should describe all measures that need to be taken to avert, mitigate, offset and monitor any negative consequences that have been identified by the ESIS; it should also assign responsibilities for implementing such measures and list the costs involved.

For category A projects, KfW Development Bank requires the executing agency to operate an appropriate monitoring system; if the projects are run by private operators, they are required to have their own environmental and social management system. Any such management system must comprise the following elements:

- adequate organisational capabilities,
- environmental and social assessment procedures,
- management programmes,
- specific environmental and social training measures,
- well-structured relations with the target group, and
- monitoring and reporting procedures.

**Category B** – Projects will be classified as category B if they may have a potentially negative impact on the environment and on the social conditions of those concerned, which, however, is less severe than that of category A projects and can usually be mitigated through state-of-the-art countermeasures or standard solutions. Typically, the potential consequences of category B projects are limited to the local area, are in most cases reversible and are easier to mitigate through appropriate measures. For category B projects, the need for and the scope, priorities and depth of an ESIS have to be determined on a case-by-case basis.

**Category C** – Projects will be classified as category C if they are expected to have no or only minor negative environmental and social consequences and if the implementation and operation of the project does not require any particular protection, compensation or monitoring measures. Category C projects usually do not require any additional analysis within the meaning of this Guideline or any further ESIA procedures. However, category C projects should be monitored for any relevant changes over their life cycle.

On climate change assessment (adaptation assessment and mitigation assessment), the project proponent must determine if the measure may have a substantial climate change relevance or not. If relevance is expected, then a detailed climate change assessment is carried out. The climate change assessment only examines the relevance, which if applicable then entails a more in-depth assessment; the result is described in the programme proposal or in internal KfW proposal documents.

## **Relevance**

The Project has been subjected to ESIA study and climate change assessments. The latter was submitted in the Feasibility Study Report and has been summarised in the Impacts Section of this report. From the impact analysis done during the ESIA study, this Project is classified under **Category B** – most of the environmental and social impacts are local in nature and scope, and reversible, and the Jacaranda area is already owned by the Project Proponent and the distribution and supply pipes will be laid within the road reserve. Where needed, only limited sections of affected persons' lands will be required for infrastructure siting. More so, this project is aimed at increasing availability of potable water within the Project Area which fits within the planning for settled areas.

### **4.4.2 Monitoring**

In order to guarantee an effective monitoring of any negative environmental, climate and social impacts, the executing agency and/or the recipient of the funds have/has to agree to certain reporting and notification duties and employ appropriate monitoring tools. To track the environmental, climate and social consequences and risks of a project, it is particularly important to supervise the application of the agreed protection measures and monitoring procedures. If an ESMP has been drawn up, it will be used as a basis for monitoring.

## 4.5

### WORLD BANK OPERATIONAL POLICIES

The Project is being financed by KfW Development Bank (Germany) which borrows heavily from World Bank on Environmental and Social Safeguards, therefore the Consultant adopted the Standard Guidelines of the World Bank Safeguard Policies in Environmental and Social Screening for the Project. The project was therefore checked against the listed Safeguard Policies and discussed below.

#### 4.5.1 OP 4.01: Environmental Assessment

This Policy requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA is a process whose breadth, depth and type of analysis depend on the nature, scale and potential environmental impact of the proposed investment. The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and trans-boundary and global environmental aspects.

Operational Policy 4.01 further requires that the EA report must be disclosed as a separate and stand-alone document by the Government of Kenya and the World Bank.

The disclosure should be both in Kenya where it can be accessed by the general public and local communities and at the Info Shop of the World Bank and the date for disclosure must precede the date for appraisal of the project.

Like the KfW Sustainability Guidelines, the World Bank also classifies projects into three categories, namely:

- Category A Projects: Impacts from these projects are expected to be 'adverse, sensitive, irreversible and diverse with attributes such as pollutant discharges large enough to cause degradation of air, water, or soil; large-scale physical disturbance of the site or surroundings; extraction, consumption or conversion of substantial amounts of forests and other natural resources; measurable modification of hydrological cycles; use of hazardous materials in more than incidental quantities; and involuntary displacement of people and other significant social disturbances.
- Category B Projects: Category B projects have impacts that are 'less significant, not as sensitive, numerous, major or diverse. Few, if any, impacts are irreversible, and remedial measures can be more easily designed.
- Category C Projects: Category C projects result in negligible or minimal direct disturbance of the physical environment.

Based on the above categorisation, this Project is classified under **Category B Projects** – most of the environmental and social impacts are local in nature and scope, and reversible, and the Jacaranda area is already owned by the Project Proponent and the distribution and supply pipes will be laid within the road reserve. Where needed, only limited sections of affected persons' lands

will be required for infrastructure siting. More so, this project is aimed at increasing availability of potable water within the Project Area which fits within the planning for settled areas.

Table 4.1 below presents a summary of how the proposed Project has been assessed against the World Bank Operational Policies (OP)

**Table 4.1 Project Assessment against World Bank OP**

<b>OP</b>	<b>Criteria in the Project</b>	<b>Discussion</b>
Environmental Assessment (OP4.01, BP4.01, GP 4.01)	Yes	The project components will trigger EA safeguards and is a Category B as already discussed above.
Forestry (OP4.36, GP4.36)	No	No forests in the vicinity.
OP/BP 4.04 (Natural Habitats)	No	No natural habitats within the Project footprint and vicinity. In particular, the abstraction point will be an expansion of an already existing WTP.
Involuntary Resettlement (OP4.12, BP4.12)	No	The Jacaranda area is already owned by the Project Proponent and the distribution and supply pipes will be laid within the road reserve. Where needed, only limited sections of affected persons' lands will be required for infrastructure siting.
Physical Cultural Resources (OP/BP4.11)	Yes	No cultural features; however, 'chance find clause' will be Applied.
Indigenous Peoples Policy OP/BP4.10	No	No indigenous peoples
OP/BP 4.09 (Pests Control Management)	No	No linkage to agricultural activities

This Chapter describes the existing biophysical and socio-economic context of the Project Area which acts as the basis for the identification and assessment of the Project's environmental and social impacts. It provides specific information within the Project's area of influence which will be directly impacted (whether positively or negatively) by the project activities, as well as high regional baseline information to put the project into context. This is provided in the sections below.

**5.1****DEFINITION OF THE STUDY AREA**

The Project is located in sections of Ruiru, Kiambu and Juja sub-counties, Kiambu County, central Kenya, on the transitional zone of the Upper Athi basin and the Kikuyu dissected plateau (GPS coordinates 0.5°N Latitude and 37°E Longitude). The three sub-counties are located off the Nairobi-Thika Super Highway, which is a section of A2 Nairobi-Addis - Ababa trunk road. The Project infrastructure traverses the following areas within the mentioned sub-counties:

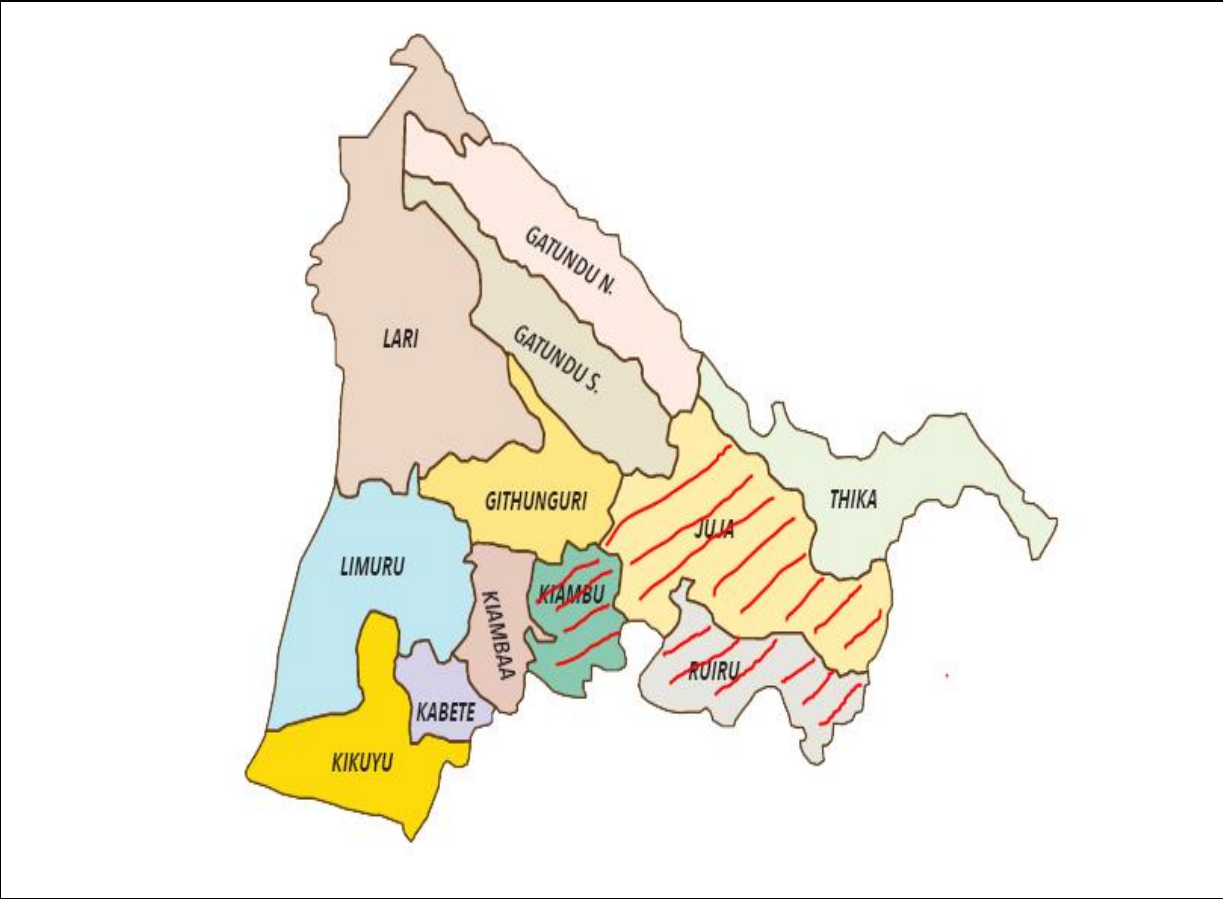
- Githurai;
- Kimbo;
- Kahawa Sukari;
- Kahawa Wendani;
- Kiuu-Githurai;
- Mwihoko;
- Ruiru;
- Wendani; and
- Mwiki.

Specifically, the Project is intended to benefit the following zones in the greater Githurai area:

- Kahawa Sukari;
- Kahawa Wendani;
- Kiuu A;
- Kiuu B;
- Mwiki;
- Mwihoko A; and
- Mwihoko B.

The sub counties within which the Project lies are as indicated with the red stripes in Figure 4.1 below.

**Figure 5.1 Study Area: Kiambu County**



**5.2 PHYSICAL ENVIRONMENT:**

**5.2.1 Climate;**

Kiambu County experiences bi-modal type of rainfall (Kiambu CIDP, 2013 – 2017). The long rains fall between mid-March to May followed by a cold season usually with drizzles and frost during June to August and the short rains between mid-October to November. The annual rainfall varies with altitude, with higher areas receiving as high as 2,000 mm and lower areas of Thika Town constituency receiving as low as 600 mm. The average rainfall received by the county is 1,200 mm.

The mean temperature in the county is 26°C with temperatures ranging from 7°C in the upper highlands areas of Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies, to 34°C in the lower midland zone found partly in Thika Town constituency (Gatuanyaga), Kikuyu, Limuru and Kabete constituencies (Ndeiya and Karai). July and August are the months during which the lowest temperatures are experienced, whereas January to March are the hottest months. The county’s average relative humidity ranges from 54 percent in the dry months and 300 percent in the wet months of March up to August.

## **5.2.2 Topography and Geomorphology;**

Kiambu County is divided into four broad topographical zone, that is, upper highland, lower highland, upper midland and lower midland zone (Kiambu CIDP, 2013 – 2017). Parts of Juja and other constituencies with the exception of Lari falls within the upper midland zone with an altitude range of 1,300 - 1,500 metres above sea level (m.a.s.l). The landscape comprises of volcanic middle level uplands. The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies. The area lies between 1,500-1,800 m.a.s.l and is characterised by hills, plateaus, and high-elevation plains. The Upper Highland Zone is found in Lari Constituency and it is an extension of the Aberdare ranges that lies at an altitude of 1,800 - 2,550 m.a.s.l. It is dominated by highly dissected ranges and it is very wet, steep and important as a water catchment area. The lower midland zone partly covers Thika Town (Gatuanyaga), Limuru and Kikuyu constituencies. It has an altitudinal range of 1,200 - 1,360 m.a.s.l.

Located on the extreme south-eastern fringes of the Aberdare Range within the Athi River drainage area, the project area is characterized by relatively gentle terrain with a general fall towards Athi River. However, the higher areas to the North West of Thika Road are characterized by deeply dissected topography with numerous streams and ridges, while the south eastern parts are lowlands with fewer streams, shallower and wider valleys. The average altitude is about 1520 m above mean sea level. The highest elevation in the project area is 1550m.a.s.l and is located around the Ruiru Prison and Training School while the lowest elevation is 1500m.a.s.l.

The project area is located on the transitional zone of the Upper Athi basin and the Kikuyu dissected plateau. The land is generally undulating with a general drainage into the Athi River basin. Ruiru River divides the township into two parts. To the North-West the town's topography is generally steep and dissected by Mukuyu and Ruiru rivers. However, these areas offer good locations for farming and housing developments. The area between the CBD and Majengo estate is trough shaped and liable to floods during heavy rains. The area south of Nairobi-Thika super highway is generally flat and offers a good location for industrial development.

## **5.2.3 Geology and Soils;**

Kiambu County is covered by three broad categories of soils, that is, high level upland soils, plateau soils and volcanic footbridges soils (Kiambu CIDP, 2013 – 2017). These soils are of varying fertility levels with soils from high-level uplands, which are from volcanic rocks, being very fertile. Their fertility is conducive for livestock keeping and growth of various cash crops and food crops such as tea, coffee, horticultural products, pyrethrum, vegetables, maize, beans, peas and potatoes. These soils are found in the highlands, mostly in Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Lari, Kikuyu, Kabete and Limuru Constituencies. Low fertility soils are mainly found in the middle zone and the eastern part of the county which form part of the semi-arid areas. The soils are sandy or clay and can support drought resistant crops such as soya beans and sunflower as well as ranching. These soils are mostly



found in parts of Juja and Ruiru (in which the Project is located), Thika Town, Kabete, Limuru, Gatundu North and Gatundu South Constituencies.

Most parts of the county are covered by soils from volcanic footbridges. These are well drained with moderate fertility. They are red to dark brown friable clays, which are suited for cash crops like coffee, tea and pyrethrum. However, parts of Thika Town, Ruiru, Juja and Lari constituencies are covered by shallow soils, which are poorly drained, and these areas are characterized by low rainfall, which severely limits agricultural development, although they are suitable for ranching and growth of drought resistant crops.

#### **5.2.4 Hydrology;**

Water in the county is from two principal sources, namely, surface and sub-surface. About 90 percent of Kiambu County's water resource comprises of both surface and ground water resource potential (Kiambu CIDP, 2013 – 2017).

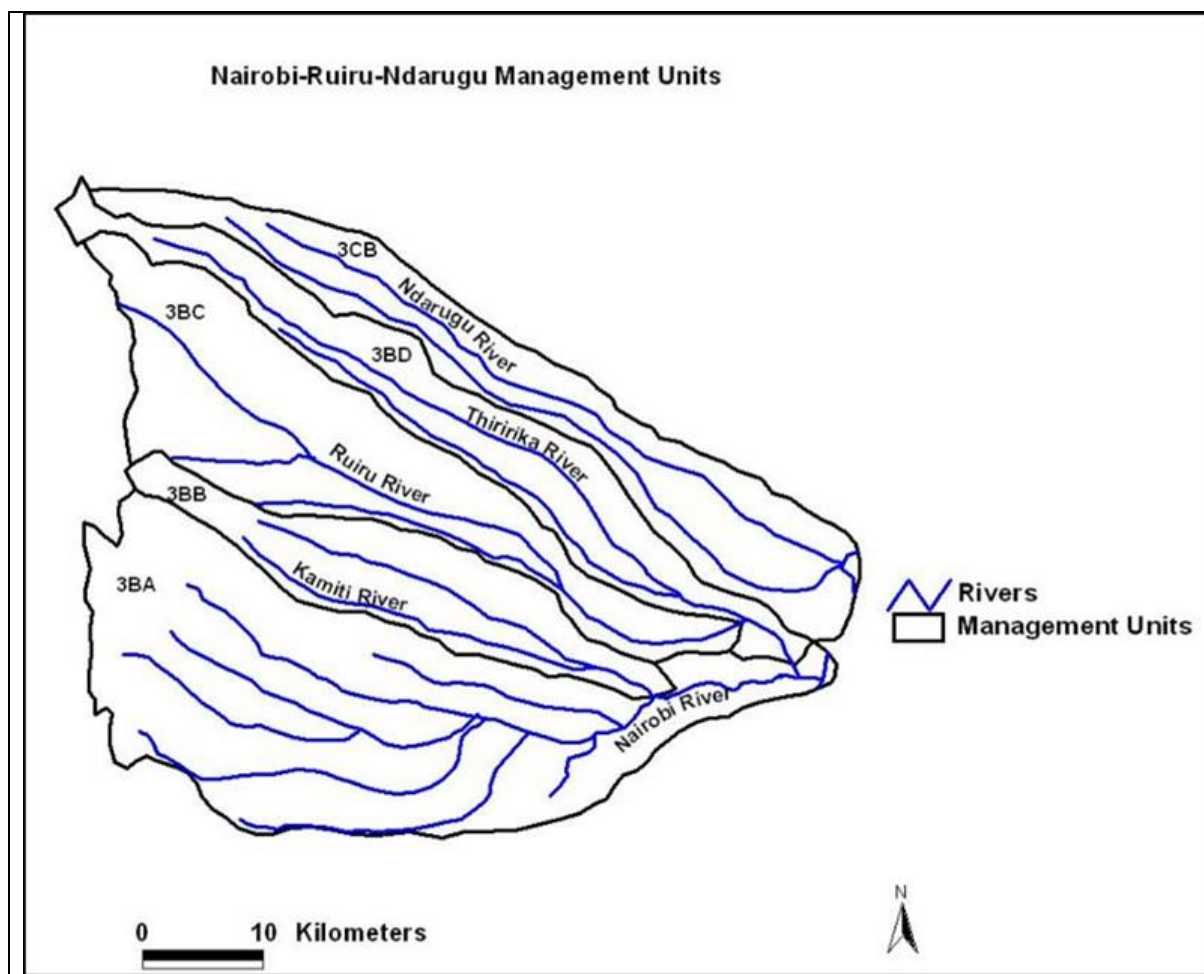
##### *Surface water*

The county is divided into five main sub-catchments areas. These are:

- 1/ The Nairobi River sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini
- 2/ The Kamiti and Ruiru Rivers sub-catchment which is located to the north of the Nairobi River sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai;
- 3/ The Aberdare plateau that contributes to the availability of two sub-catchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment;
- 4/ The Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdare ranges; and
- 5/ The Ewaso Kedong sub catchment which runs in the North-South direction and occupies the western part of the county. It has several streams that normally form swamps.

The Project Area is located within the Nairobi River sub-catchment and the Kamiti and Ruiru Rivers sub-catchment. The Project will abstract water from the Ruiru River which rises from the Kikuyu Escarpment Forest to the east of the Rift Valley at an altitude of 2660 m.a.s.l and flows in a southeast direction through the proposed water abstraction point to discharge into Thiririka River downstream. The Ruiru River sub-catchment comprises the Ruiru River Management Unit. Other streams in the Ruiru River Management Unit include Bathi, Gatamaiyu, Mukuyu and Thiririka as indicated in Figure 5.2.

**Figure 5.2 Rivers and streams in Ruiru River Management Unit**



*Source: Ruiru River hydrological assessment report, July 2017*

The Project Area is mainly drained by Bathi, Gatamaiyu, Komothai, Theta Rivers, Thiririka and Ndarugu Rivers. Other streams arising from springs including Kamiti and Riara, creating a network of tributaries for the main rivers as well as water sources for the local communities.

River Ruiru flow duration analysis indicates the following flow thresholds (29,030.4 m<sup>3</sup>/day) (Refer to a copy of the hydrology report attached for more details):

- Reserve Flow (Q95) - 0.336 m<sup>3</sup>/s (29,030.4 m<sup>3</sup>/day).
- Normal Flow (Q80) - 0.814 m<sup>3</sup>/s (70,329.6 m<sup>3</sup>/day).
- Flood flow threshold (Q50) - 2.039 m<sup>3</sup>/s (176,169.6 m<sup>3</sup>/day).

#### *Ground water*

Kiambu County has two main sub-surface aquifers; the Nairobi Suite and Basement Athi Suite. Most of the ground water exploitation is from the Nairobi Suite which is predominantly volcanic. These are mainly through numerous boreholes with an average yield of 7m<sup>3</sup>/hr and pumps set at an average depth of 200 to 300 m deep.

Some of the areas like Kiambu and its environs have ground water with high fluoride content (Kiambu CIDP, 2013 - 2017).

### 5.3

#### **BIOLOGICAL ENVIRONMENT:**

Kiambu County does not have any national park or game reserve; however, it contains some natural/indigenous and plantation forests (Kiambu CIDP, 2013 - 2017). Biodiversity of Kiambu County, comprising Ruiru and Juja areas, is highly influenced by the Aberdares ecosystem with respect to indigenous plant cover species. However, due to human activities such as settlements, farm lands and agro-forestry, all the habitats within the Project Area are highly modified and are currently of no conservation concern. Provided below is a brief description of the flora and fauna of the Project Area.

##### *Flora*

Due to human activities, the indigenous plant species of the Project Area have been displaced by exotic species that have also acquired economic values among the communities. Such plant species include tea, coffee, Eucalyptus spp, Cypress ssp, Caussurina spp, grevillia spp and wattle trees species. Other plant features include grass species, ferns, nappier grass, avocado, banana, yams (mainly in the river flood plains), cassava, sugarcane, pineapple, arrowroots, and coffee).

##### *Fauna*

Kiambu County has few wildlife resources since many gazetted forests were allocated illegally to individuals (Kiambu CIDP, 2013 – 2017). However, suitable fauna habitats still exist in the Kinare forest in Lari Constituency, whose ecosystem constitutes a dense forest with elephants, hyenas, bush baby, baboons, colobus monkeys, dik-dik, bush pigs, tree and ground squirrels, porcupines and many species of birds such as weaver, guinea fowls, sparrow among others.

The Project Area has been highly modified by human activities. Notable fauna within the Project Area comprises limited rodents such as squirrels, moles and different bird species.

Other fauna comprises of livestock such as dairy cows and sheep, poultry and house pets (dogs and cats).

##### *Aquatic biodiversity*

The main aquatic biodiversity within the rivers in the Project Area include frogs and freshwater fish species found naturally in the rivers. Due to the modification of the habitats, the present aquatic biodiversity species have already adapted to the modified conditions.

## **5.4 SOCIO-ECONOMIC ENVIRONMENT**

### **5.4.1 Introduction**

The socio-economic baseline survey was conducted during the preparation of the ESIA and RAP for the Project. The aim of the survey was to establish a robust characterization of general pre-project socio-economic conditions against which future changes can be measured.

The socio-economic study was aimed at obtaining and analysing information relating to:

- administrative context and governance;
- demographic baseline;
- land ownership and use;
- gender roles and decision making;
- economy, livelihoods and employment;
- education and literacy;
- health;
- social infrastructure;
- housing;
- vulnerable groups;
- Archaeology and Cultural Heritage;
- Security.

### **5.4.2 Socio-economic Data Collection Methodology**

The methodology applied during the collection of socio-economic data is as briefly explained below:

#### *Review of secondary data*

Available secondary literature such as the Kiambu County Integrated Development Plan, 2013 – 2017 was reviewed mainly to obtain high level information about the Project Area.

#### *Qualitative and quantitative field methods*

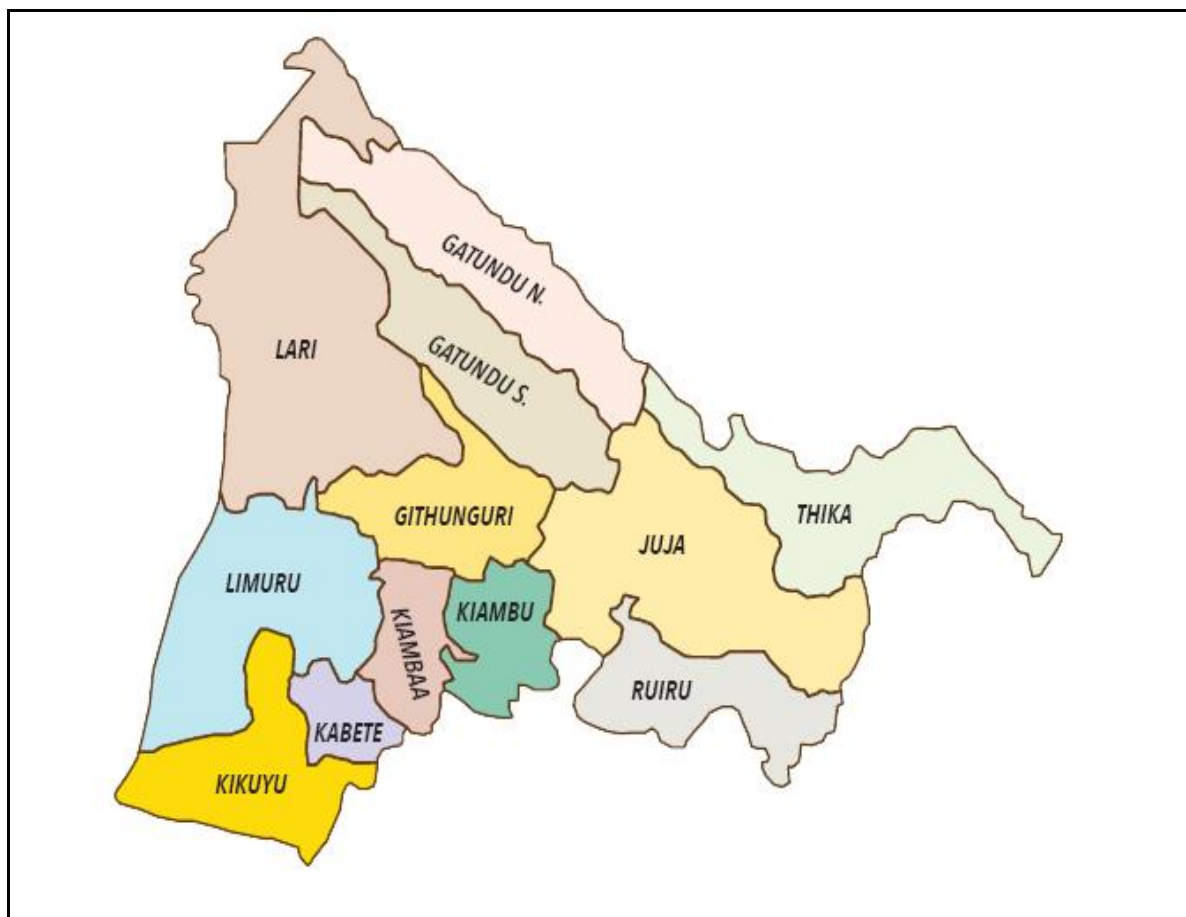
Field surveys through the use of questionnaires and PAP census was conducted to collect the current information on the socio-economic environment of the Project Area. Data collected by this method was supplemented by Key Informant Interviews (KII) with identified key informants. Due to the high level of efforts required, data collection using this method was limited to the Project Area of Direct Influence (refer to the RAP report annexed to this ESIA report for details of all the meetings held).

Additional qualitative and quantitative secondary data was collected through the conduct of Focus Group Discussions (FGDs) with identified special groups within the Project Area as well as stakeholder consultations with the identified Project stakeholders including the local community members.

### 5.4.3 Governance and Administration

Kiambu County is divided into twelve (12) sub-counties namely Limuru, Kikuyu, Kabete Lari, Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Ruiru, Juja and Thika Town (Figure 5.3). The sub-counties are further divided into 60 wards.

**Figure 5.3 Kiambu County Administrative Units**

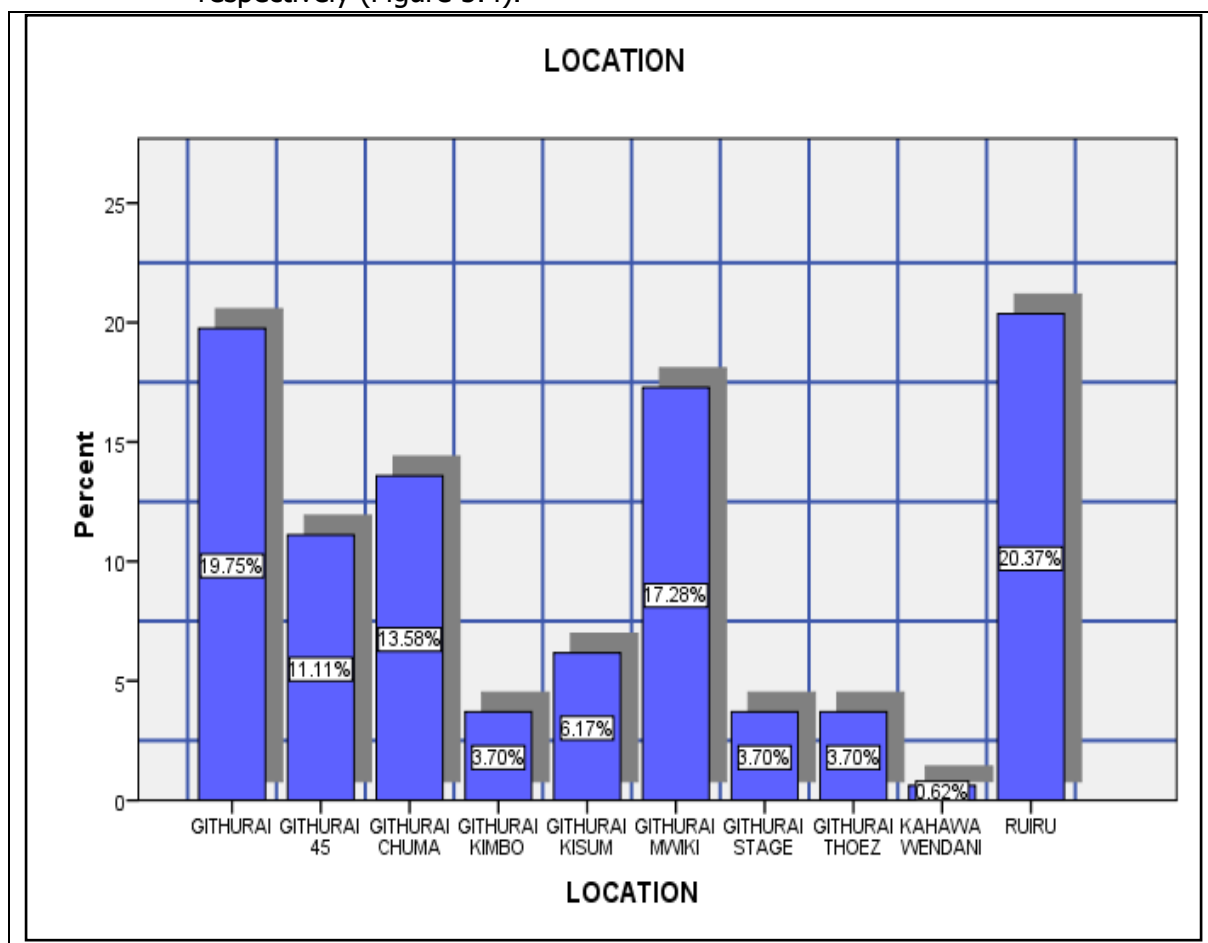


The Project falls within Kiambu, Ruiru and Juja sub-counties, administered by sub-county administrators. The project will construct a new distribution system in the Greater Githurai area, comprising the sub-locations of Kiuu, Mwiki, Kahawa Wendani, Kahawa Sukari, Mwhoko A and Mwhoko B, which are located within the service area of RUJWASCO, but not currently supplied by RUJWASCO

### 5.4.4 Population and Demographics

In the census year of 2009, Kiambu County had a total population of 1,623,282 persons of whom (820,673) 51% were females and 802,609 (49%) were males (Kiambu CIDP, 2013 – 2017). At a population growth rate of 2.81%, the total population of Kiambu County was projected to be 2,032,466 persons in 2017 of whom 1,027,542 would be females and 1,004,924 would be males. Population projections further indicated that Ruiru Town would have a total population of 149,887 persons in 2017 making it the highest populated town in Kiambu County.

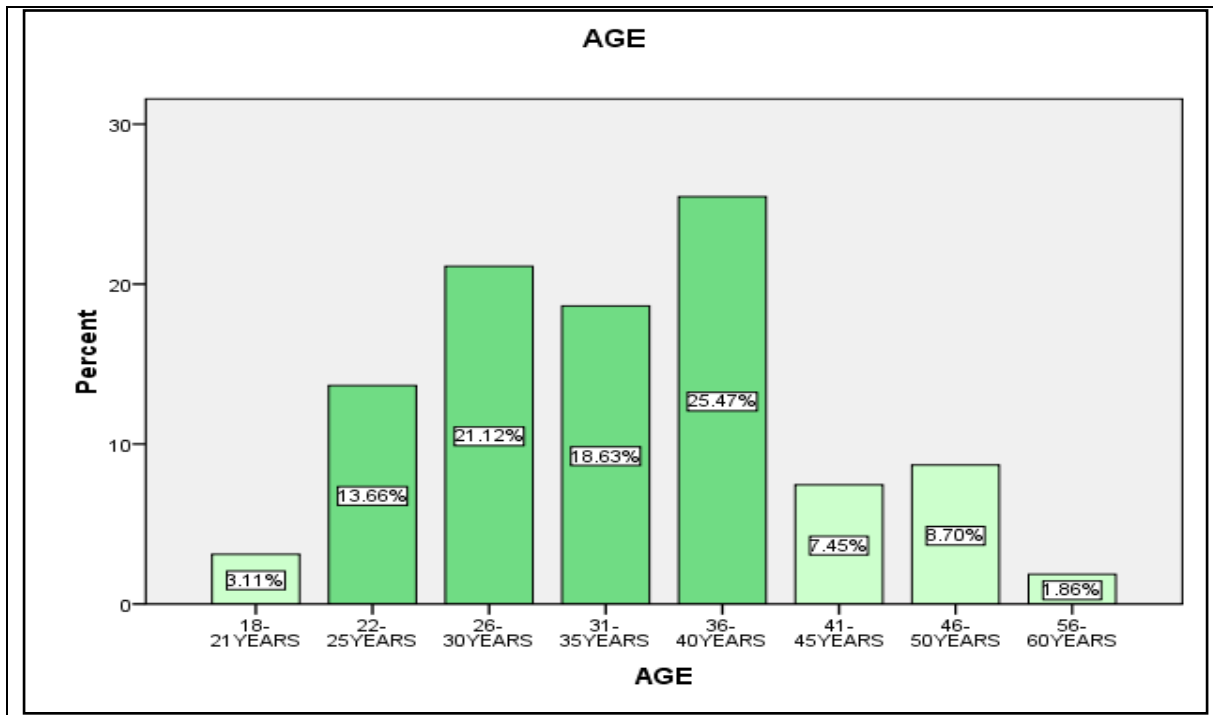
The Project targets about 188,500 beneficiaries. There are 237 Project affected persons, who were interviewed during the study. Kahawa Wendani area accounted for the least number of respondents (0.62%) while Ruiru and Githurai had the highest number of respondents at 20.37% and 19.75% respectively (Figure 5.4).



*Figure 5.4: Location of Respondents*

The majority of respondents interviewed were females, having a frequency of 161 which resulted in 67.9%. Males were 76 in number accounting for 32.1%. The project will therefore have to factor in gender-based programs that will ensure women, who are the majority in the project area are taken care of. Males should also be well represented in all decisions so as to ensure equity.

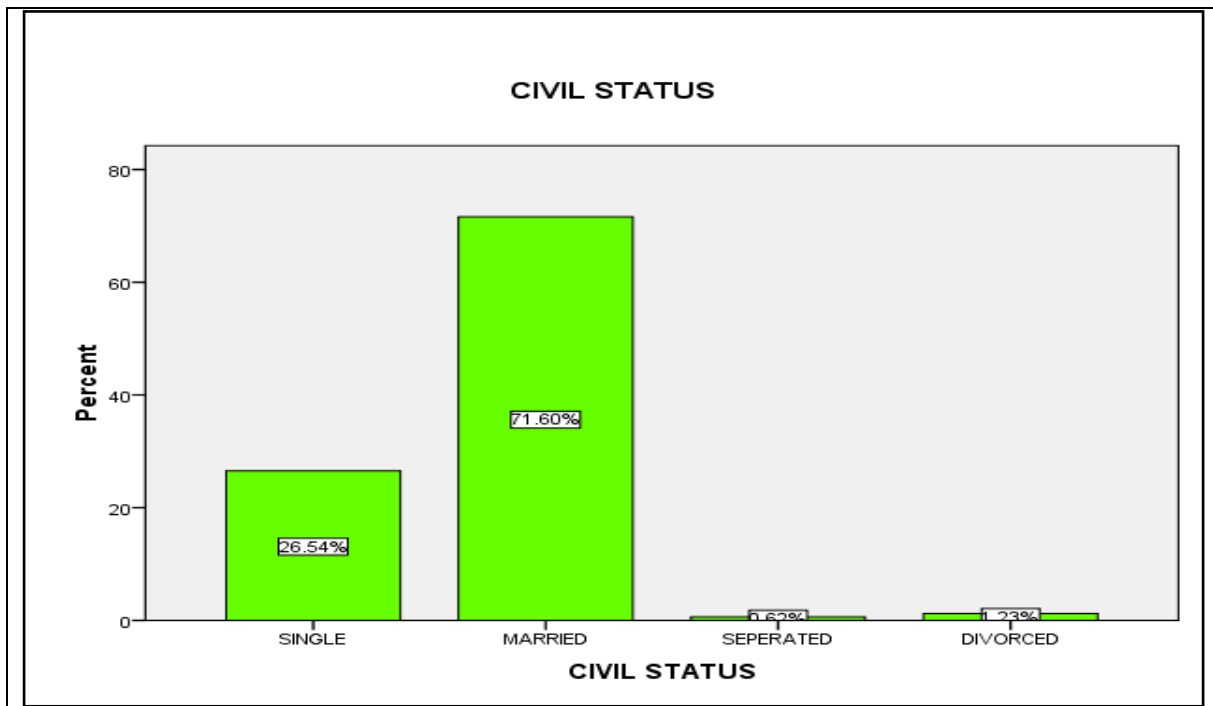
Predominantly the respondents were aged between 36-40 years at 25.47%. The very least age group in terms of frequency was 56-60 years and 18-21 years which had 1.86% and 3.11% respectively; this shows persons who are vulnerable due to age are very few.



*Figure 5.5: Age of Respondents*

The project area therefore has a youthful population with those aged from 18-40 years accounting for 81.99%. The youthful population in project area can be involved during construction phase. The youth should also be involved in decision making process.

The study found out that most respondents were married this accounted for 71.60%, 26.54% were single, 1.23% were divorced, 0.62% were separated.



*Figure 5.6: Civil Status of Respondents*

About 24.53% of households interviewed are female headed while 75.47% are male headed; female headed households therefore face threat of under representation. Furthermore, for the divorced, single and married; female were the majority at 100%, 76.7% and 64.7% respectively.

*Table 5.1: Civil Status and Sex Cross Tabulation*

			SEX		Total
			MALE	FEMALE	
CIVIL STATUS	SINGLE	Count	10	33	43
		% within CIVIL STATUS	23.3%	76.7%	100.0%
	MARRIED	Count	67	123	191
		% within CIVIL STATUS	35.3%	64.7%	100.0%
	SEPERATED	Count	1	0	1
		% within CIVIL STATUS	100.0%	.0%	100.0%
	DIVORCED	Count	0	2	2
		% within CIVIL STATUS	.0%	100.0%	100.0%
Total		Count	77	160	237
		% within CIVIL STATUS	32.1%	67.9%	100.0%

Within the targeted project area, Kahawa Sukari is a high-cost area with large residential houses and paved streets including street lightning, Mwiki and Kahawa Wendani sub-locations consist of mainly high density low cost areas with small commercial centres. Mwihoko is a currently less populated sub-location and Kiuu is a large mixed area, ranging from mainly high density, low cost housing close to the highway, and becoming less populated and more mixed further from the highway. The entire project area can be classified as urban with population densities ranging from 700 to nearly 45,000 people per km<sup>2</sup>.

#### **5.4.5 Education**

The County has a high literacy rate. The percentage of people who can read stands at 95.6% (Kiambu CIDP, 2013 – 2017). More so, 95.2 percent of the total population can write. About 95.4 percent of the total population within the county can read and write.

Most primary and high schools are located a significant distance from the Project area, but virtually all families have members who have been to school. In the project area, most of the respondents are high school graduates at 40%; those with no education at all are 0.25% (Figure 5.7). The majority of people in project area are able to read and write.



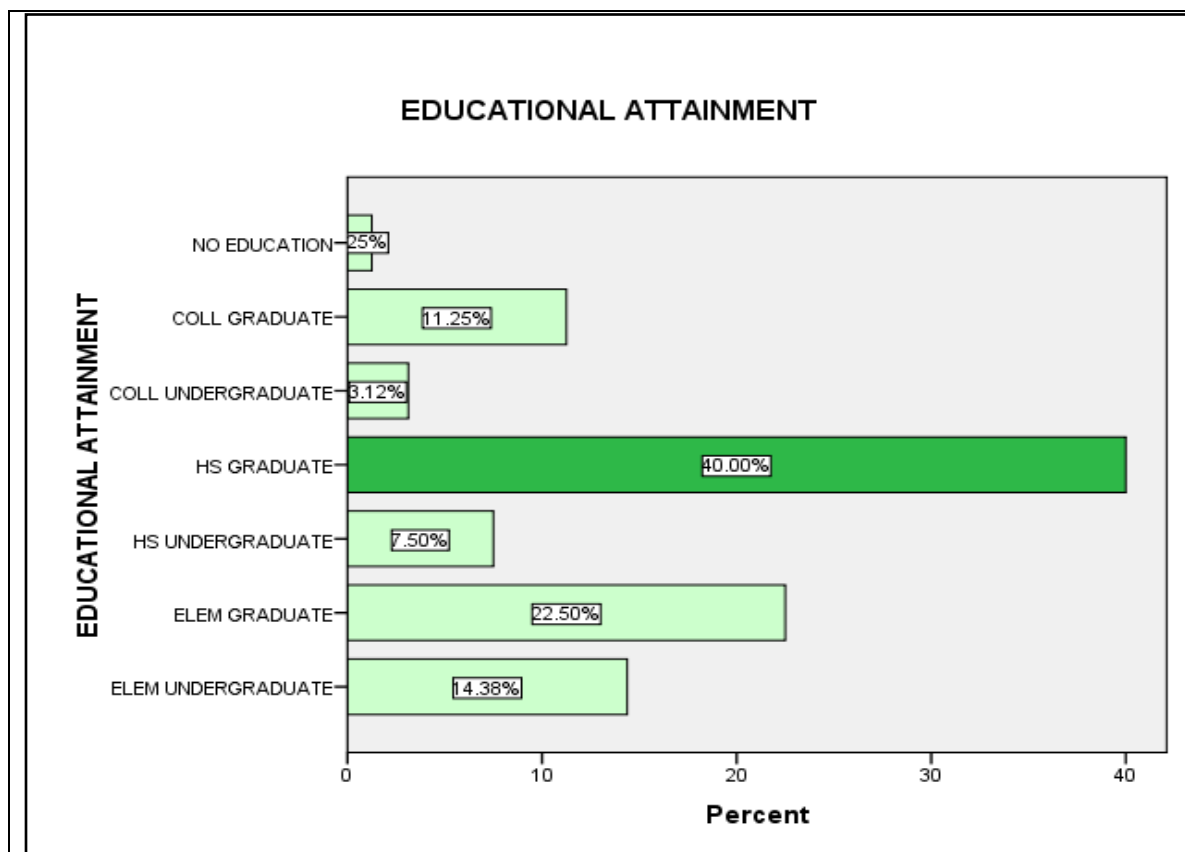


Figure 5.7: Education Levels of Adults in the Project Area

In the project area most of the decisions are made by both father and mother (livelihood 45.1%, family 45.1%, community affairs 47.5%, financial 47.5%) (Table 5.2).

Table 5.2: Decision Makers in Households.

		Column N %
LIVELIHOOD DECISIONMAKER	FATHER	30.2%
	MOTHER	24.7%
	BOTH	45.1%
FAMILY DECISIONMAKER	FATHER	27.8%
	MOTHER	27.2%
	BOTH	45.1%
FINACIAL DECISIONMAKER	FATHER	27.8%
	MOTHER	24.7%
	BOTH	47.5%
COMMUNITY AFFARS	FATHER	27.8%
	MOTHER	24.7%
	BOTH	47.5%

#### 5.4.6 Land Use, Tenure and Ownership

The average holding size of land in Kiambu County is approximately 0.36 Ha on small scale and 69.5 Ha on large scale (Kiambu CIDP, 2013 – 2017). The small land holdings is mostly found in upper parts of Gatundu North, Gatundu South, Kiambaa, Limuru and Kikuyu constituencies. The large land holdings are usually

found in the lower parts of the county especially in Juja constituency and the upper highlands in Limuru and Lari constituencies. The fragmentation of the land has made it uneconomical and hence majority of the farmers are converting their farms into residential plots to supplement the meagre income from the farms.

Land tenure in the Project area is largely by leasehold. About 85% of the population with land in the County have title deeds to their land and there are no recorded cases of incidences of landlessness. The remaining 15% have not received their title deeds due to unfinished land adjudication process and non-payment of the necessary levies.

Property owners in the project area account for 55.13%, co-owner accounted for 1.28%, renters 39.74%, share/ free occupant 3.85%. The main land use in the project area is residential. About 73.33% of the respondents had residential land alone, while those with both residential land and a structure were about 6.67%. The project will therefore be dealing mainly with land owners when acquiring the required project land for the sections where the alignment does not fall within the existing road reserve.

The greater Githurai Area can be categorized as an urban, residential area, with some light commercial activities. It ranges from high density apartment blocks of low to medium class, and some medium and high class individual housing. Further away from the highway is currently less developed, with more vacant plots.

#### **5.4.7 Livelihoods and Economic Activities**

The main economic activities in Kiambu County include farming, food processing, manufacturing (such as leather), mining (carbacid), textile (cotton), motor vehicle assembly and repair, wholesale and retail trade (Kiambu CIDP, 2013 – 2017).

Agriculture is the predominant economic activity in the county and contributes 17.4 per cent of the county's population income (Kiambu CIDP 2013 – 2017). Majority of the people in the county depend on the sub sector for their livelihood, with 304,449 directly or indirectly employed in the sector. The main crops grown include pineapples, tea, coffee, wheat, macadamia nuts, poultry, horticulture, dairy, and fish.

Some of the inhabitants of the project area also keep livestock such as cattle, sheep, goats, pigs, donkeys and camels; however, there are no ranches within the county. Livestock rearing is for meat, milk, mutton and pork. Poultry rearing and apiary are also carried out in the county.

In rural areas, 157,473 persons are engage in agricultural activities for their livelihoods (Kiambu CIDP, 2013 – 2017).

Growth in the agriculture sub-sector has been encouraged by a ready urban market in Thika, Ruiru, Kiambu and Nairobi and the availability of agro-

processing industries such as Farmers' Choice Ltd, Kenchic Co. Ltd, Brookside Dairies, Githunguri Dairies, Ndumberi Dairies, Limuru Milk and Palmside Dairies, among others.

Due to dwindling availability of formal jobs in the county, most of the people have reverted to self-employment which contributes to 31 per cent of households' income in the county. Most of the self-employed persons have set up businesses and small-scale industries.

Most residents of the Project Area are either skilled or unskilled and most of them are employed in coffee plantations, tea farms, industries, quarry sites and other agricultural farms.

#### **5.4.8 Health**

The average distance to the health facility in Kiambu County is 7Km and the facilities are well accessed since the road network is generally good (Kiambu CIDP, 2013 – 2017). There is a level 3 Public Hospital in Juja, and a number of private hospitals within the Project area, that is, Ruiru, Githurai and Kiambu.

The most prevalent diseases in the county are Flu which accounts for 35.3% of the total hospital visits, Malaria which accounts for 18.6% of the total hospital visits, Respiratory Tract Infections (RTI) which accounts for 9.7% of the hospital visits, and Ear, Nose and Throat Infections which accounts for 3.1% of the hospital visits. HIV/AIDs is also a major health problem in Kiambu County. The age group 20-49 years is the most affected, resulting in significant numbers of HIV/AIDs orphans in the county and loss of families' incomes which is directed towards addressing the pandemic in the households.

#### **5.4.9 Water and Sanitation**

##### *Water*

In Kiambu County, 75% of residents use improved sources of water (protected spring, protected well, borehole, piped into dwelling, piped and rain water collection), with the rest relying on unimproved sources (such as pond, dam, lake, stream/river, unprotected spring, unprotected well, jabia and water vendor) (KNBS, 2013). Use of improved sources is higher in male headed households at 76% than in female headed households at 73%.

Currently, water supply to the Project Area is by the Nairobi City Water and Sewerage Company (NCWSC). Information from NCWSC's metre readings indicate that between July and September 2016, an amount of 2,000 – 3,000 m<sup>3</sup> was supplied to the project area per week (not including part of Mwiki, which would be additional to this amount). This 2,000 to 3,000 m<sup>3</sup> is spread over the 4 days per week when water is supplied. More recent meter readings are not available and it is reported that reading of the meter is no longer done. However, it is also reported that in 2017 the amount of water supplied is likely to be less, because the dry spell experienced led to more rationing.

In addition to the above, a few of the community members within the greater Githurai Area get water from both private and community boreholes.

The current actual demand for water in the area supplied by NCWSC is estimated to be about 5,000 m<sup>3</sup>/day, hence less than 10% of the demand is covered by NCWSC and this is also not a continuous supply. This implies that the project area currently has insufficient improved sources of water and unless alternative sources are identified, water shortages will continue to increase as the demand increases due to projected increase in the number of settlements and population growth.

Due to the current insufficient improved sources of water, many people in the project area rely on unimproved sources of water such as seasonal streams, rivers Ruiru and Bathi, tankers and buying from mobile water vendors.

### *Sanitation*

A total of 80% of residents in Kiambu County use improved sanitation, while the rest use unimproved sanitation (KNBS, 2013). Use of improved sanitation is almost equal in male headed households at 80% and female headed households at 79%.

Most of the project area population appreciates cleanliness and hygiene, and are relatively conscious of their hygiene and the need for clean water.

Wastes generated at various levels of the community are generally assimilated into the environmental system. Such wastes include:

- Farm wastes such as dead plant matter and livestock manure allowed to decay in the farms directly contributing to soil conditioning;
- Agro-chemical wrappers and containers at the farm level, mostly left to decay while plastics and polythene packaging are burned at the farms with chemical residuals going into the environment;
- Garbage from homes is dumped at household level waste pits and burned whenever necessary or left to decompose to compost manure; and
- Urban wastes from the shopping centres largely dumped at specific locations and occasionally collected by the County waste contractors.

It was noted that significant amounts of waste find its way to the storm drains, streams and rivers, especially during rains.

## **5.4.10 Social Infrastructure and Services**

### *Road and rail network*

Kiambu County has a good road network. It has a total of 2,033.8 km of roads under bitumen standards, 1,480.2 km under gravel surface and 430.1 km under earth surface. There is a great need in improving the condition of the roads since during the rainy season, most of the roads become impassable. However, the terrain poses a great challenge for road maintenance. There has been a lot

of improvement in the roads sub-sector with the outstanding one being the construction of the Nairobi - Thika super highway.

Kiambu County also has 131 km of railway line and four railway stations in Ruiru, Thika, Kikuyu and Limuru towns. The rail is not fully utilized in the county and only passenger trains operate in the morning and evenings between the City of Nairobi and the four stations. However, there is a great potential in the sector and hence efforts need to be put in place to ensure the infrastructure is improved which will encourage introduction of modern efficient trains.

#### *Electricity connection*

Electricity connection to individual homes is low in rural sections and there is need for up-scaling, while most urban areas, industries and town centres are adequately connected to the national electricity grid.

#### *Mobile communication network*

Kiambu County is well covered by mobile communication networks which are estimated at 98% even though landline coverage is very poor with only 214 connections in the entire county.

The Project area has 100% network coverage.

#### *Housing infrastructure*

According to 2009, Kenya Population and Housing Census, 48.3% of all homes in the county are stone –walled, 4.9% are brick/block, 4.8% are mud/wood.

According to the socio-economic survey data collected during the conduct of the RAP, 42.86% of the respondents had residential structures while 57.14% had commercial structures. Generally, commercial structures account for majority of structures in the project area.

### **5.4.11 Vulnerable Groups**

Households with at least one member mentally or physically disabled were 1.6 %. Generally, the availability of special services for the disabled in the country and the project area is limited; support is in majority of the cases given by family members and the larger community as a coping strategy. This section of population with physical or mental disabilities, depending on their situation, will require special assistance to understand the need to relinquish property or current homes, orient themselves to new areas, find out an alternative and service providers, and meet a whole set of other specific needs.

In project area 1.6% of the household heads are above 60 years and outside the labour participation bracket. Resettlement experience worldwide shows that the elderly often fail to adapt following displacement. This group of residents tend to have a lifelong "place attachment," lack the economic opportunity or the capacity to obtain new sources of income and lose traditional leadership roles or social standing as a result of community dispersion or social change.

Like young children, the elderly are disproportionately vulnerable to diseases and even death in resettlement operations, and therefore this project will have to take into consideration their special needs in relation to the businesses owned or run by families hosting these categories of people.

#### **5.4.12 Cultural Heritage**

The Project area is highly modified through agricultural activities, settlements and industries. No significant cultural or archaeological finds were made during the study. No reported finds have been made previously by the National Museums of Kenya, either.

#### **5.4.13 Security**

The peri-urban nature of the project area makes it significantly susceptible to security challenges. Most households interviewed were generally aware of their obligations with regard to security. The main security threats in the county include burglary, robbery with violence, petty crimes such as pick-pocketing and land related conflicts.

## 6 CONSULTATIONS AND PUBLIC PARTICIPATION

### 6.1 OVERVIEW

The Consultation and Public Participation Process (CPP) is a mandatory requirement stipulated in Section 58 of EMCA 1999 for the purpose of achieving the fundamental principles of sustainable development. Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all ESIA Studies incorporate public consultation, with an aim of ensuring that stakeholders of a proposed project are identified and their views, opinions, concerns and recommendations are considered during project planning, design, construction, operation and decommissioning phases.

### 6.2 OBJECTIVES OF THE CONSULTATIONS

The overall goal of the consultation process is to disseminate project information and to incorporate the views of the stakeholders with interest or influence in the Project, and Project Affected Persons (PAPs), in the design of the mitigation measures and an Environmental Management Plan.

The specific objectives of the community consultations are to:

- Inform the public about the proposed Ruiru-Juja Water Supply Project and obtain information that is specific to the project area;
- Provide an opportunity to the community to air their views, concerns and recommendations for the improvement of project design, and thereby minimize conflicts and delays in implementation;
- Make the resettlement process transparent and foster project-community partnerships;
- To identify perceived socio-economic and environmental impacts by the community and their preferred mitigation measures for adverse impacts, and enhancement measures for the positive impacts; and
- To enhance project acceptability and long-term ownership and sustainability.

### 6.3 STAKEHOLDER IDENTIFICATION

The project stakeholders were identified and categorized into two groups. These are:

- **Primary stakeholders:** the beneficiaries of a project or the ones directly affected, both positively and negatively by the project. They are referred to as the Project Affected Persons (PAPs). The primary stakeholders of this project include the community members of the following settlements which are located within the project area:
  - Guthurai,
  - Kimbo,
  - Kahawa Sukari,
  - Kahawa Wendani,
  - Kiuu-Githurai,
  - Mwihoko,

- Ruiru, and
  - Wendani.
- **Secondary stakeholders:** they are indirectly affected by the project, but influence development particularly the stakeholders involved in resettlement planning and implementation. They comprise of respective government agencies, local administration, and County Government among others.

Table 6.1 presents a summary of the stakeholders identified for the proposed project.

**Table 6.1 Summary of Stakeholders identified for the proposed project**

Category	Name	Relevancy
Primary stakeholder	Community members of: <ul style="list-style-type: none"> <li>• Guthurai,</li> <li>• Kimbo,</li> <li>• Kahawa Sukari,</li> <li>• Kahawa Wendani,</li> <li>• Kiuu-Githurai,</li> <li>• Mwihoko,</li> <li>• Ruiru, and</li> <li>• Wendani.</li> </ul>	Settlements containing the directly affected persons.
	Local Administration officers/ Chiefs and Assistant Chiefs: <ul style="list-style-type: none"> <li>• Ruiru Location;</li> <li>• Kahawa Sukari Sub-Location;</li> <li>• Mwihoko Sub-Location; and</li> <li>• Githurai Sub-Location.</li> </ul>	Responsible for the day to day administration of the directly affected settlements.
	Wards within the project area	Works closely with Local Administration Officers.
	RUJWASCO	The entity already permitted to abstract 13,000 m <sup>3</sup> /day along River Ruiru at Jacaranda. The owner of the existing Jacaranda WTP proposed for expansion during the implementation of this Project.
	NCWSC	The currently known supply of potable water within the project area.
Secondary stakeholders	County government of Kiambu County	The county responsible for the planning and administration of the project area.
	Nairobi City Water and Sewerage Company	The institution currently supplying potable water in parts of the project area.
	Athi Water Services Board	The institution responsible for the development of water supply schemes in the project area.
	National Environment Management Authority (NEMA)	Institution responsible for foreseeing environmental management within the project area including the review and approval of the ESIA report.



<b>Category</b>	<b>Name</b>	<b>Relevancy</b>
	Water Resources Authority (WRA)	Institution responsible for managing water resources within the country. The abstraction of water for the project will require a water abstraction permit from WRMA.

## **6.4**

### **APPROACH TO THE PUBLIC CONSULTATION**

The ESIA team conducted public participation within the project area with an aim of giving the community a platform of expressing their environmental and social concerns in relation to the project. The sample for the public consultation was generated from people in the areas traversed by the project components which include the water source, treatment plant, transmission main, water reservoir, and the consumer areas, which are divided into six (6) zones namely: Kahawa Wendani, Kahawa Sukari, Mwihoko A, Mwihoko B, Kiuu (A and B) and Mwiki. The consultation areas were selected by virtue of hosting the Project Affected Persons (PAPs) and due to their ability to provide a fair representation of the various interest groups in the community and therefore a diversity of views. Participants for the public meetings were drawn from the areas traversed by the water development project as outlined in Table 5.1 below.

**Table 6.2 Areas Covered during the Public Consultation Exercise**

<b>No.</b>	<b>Administrative Area</b>	<b>Consultation Locations</b>
1	Ruiru Location	Water source
		Treatment Plant
		Transmission main
2	Kahawa Sukari Sub-Location	Kahawa Sukari
		Kahawa Wendani
3	Mwihoko Sub-Location	Mwihoko A
		Mwihoko B
4	Githurai Sub-Location	Kiuu
		Mwiki

## **6.5**

### **INCORPORATION OF VIEWS OF VULNERABLE GROUPS**

Generally, the population in Ruiru-Juja project area is cosmopolitan and resides in an urban-peri-urban environment. The project area is diverse characterized by small and large manufacturing industries, educational institutions, large commercial outlets, micro and small enterprises, coffee farms and quarries, some of which provide a source of livelihood to the project beneficiaries. In the context of this project, vulnerable groups include women, children, youth, disabled persons, and the elderly and indigenous people in conformance with the KfW Sustainability Principles of April, 2016.

In many African societies, women and children typically bear the burden of household chores which include ensuring availability of water in the homestead and maintaining cleanliness and hygiene. Residents of Kahawa Wendani and parts of Githurai indicated that they do not have reliable water as they experience frequent water shortages. The alternative to the main supply is to buy from mobile water vendors who operate hand carts and for those who are close to water kiosks, they get their supply from the said source. Reducing the burden of water collection, most notably for women and the girl child, has a gender dimension as it has the potential to:

- Increase girls' concentration on their studies as they do not have to spend time moving to buy from the water kiosks after school;
- Improve household health due to access to clean water and improved hygiene;
- Reduce physical strain on women and girls from lifting and carrying heavy loads of water; and
- Increase safety, as women and girls do not have to roam the neighborhood at inconvenient hours to get water.

To ensure that the views of the vulnerable groups are taken into consideration in the planning and detailed design of the project, efforts have been made during the ESIA consultations at community level to solicit for their opinions and contributions on how the project is likely to affect them, and proposals for mitigation of adverse impacts. The results of these consultations were used as input into the ESMP as well as for detailed design consideration. All issues raised

have been summarized in this ESIA report, and stakeholders should review to ensure that concerns are adequately addressed.

## 6.6 FOCUS OF THE PUBLIC CONSULTATIONS

Public participation forums/ Barazas were organized through administration of an open-ended questionnaire aimed at introducing the project to the residents, gathering their views and concerns related to the project and incorporating their views into the project (Table 6.3). Please refer to the annexed RAP report for details of the meeting minutes, meeting photos and attendance registers.

The consultations with project beneficiaries were guided by the themes outlined below.

- a) **The proposed project:** The community was sensitized on the components of the project, the legal requirement for public consultation and the policies guiding the project.
- b) **Current Water Supply:** The justification of the project since certain areas proposed for coverage by the Ruiru-Juja project experience frequent water shortages while others are not within the distribution network.
- c) **Encroachment:** It is apparent that certain sections of the pipeline corridor have been encroached particularly in Ruiru Town, Kahawa Wendani and Githurai, and the PAPs will need to be relocated to pave way for construction.
- d) **Environmental Impacts:** The community was consulted to gather views on the perceived impacts on various aspects including vegetation, soils, air quality, noise levels, water resources and their preferred mitigation measures for negative impacts.
- e) **Health and Safety:** Issues of occupational health and safety during construction were discussed and the community asked that the legal and regulatory standards be adhered to prevent accidents.
- f) **Socio-Economic Impacts:** This largely revolved around business activities that locals can do during construction, how the project will affect the existing businesses and the opportunities for employment in the project.

*Table 6.3: Summary of Public Barazas Held*

Location	Date	Venue	Attendance
Ruiru	20/12/2017	Ruiru	37
Kahawa Wendani	13/06/2017	Chief's Office	32
Mwihoko	02/03/2018	Chief's Camp	47
Kiu	03/03/2018	Chief's Camp	21

## 6.7

### SUMMARY OF OUTCOMES OF PUBLIC CONSULTATIONS

Table 5.2 below covers the matters arising from the public consultation pertaining to the proposed water development project. The consultant recommends that the issues discussed in this section be addressed to enhance project acceptability and sustainability.

**Table 6.4 Summary of Consultations with Residents of Ruiru-Juja Area.**

S/No.	Aspect	Comments
1.	Environmental and Safety Issues	<ul style="list-style-type: none"> <li>• The project will generate additional waste during the construction phase;</li> <li>• There will be noise from construction vehicles and machinery;</li> <li>• Soils will be exposed making them prone to erosion; and</li> <li>• Adhere to Occupational Health and Safety, as well as Public Health standards to prevent accidents and ensure public safety.</li> </ul>
2.	Socio-Economic Issues	<ul style="list-style-type: none"> <li>• The Contractor should give locals first priority for skilled and unskilled positions;</li> <li>• Community will generate income from operating water kiosks;</li> <li>• Community will generate income from supplying food to construction workers;</li> <li>• Sanitation and hygiene will improve health standards;</li> <li>• Increased agricultural productivity due to availability of water for irrigation;</li> <li>• Reduced illegal connections to the main transmission pipe;</li> <li>• Project will bring about economic development of the wider project area;</li> <li>• Women who earn their living from roadside kiosks will be evacuated and their income source will be disrupted for a while;</li> <li>• Traffic snarl up due to roadside construction works; and</li> <li>• Interference with water supply during construction period.</li> </ul>
3.	Relocation Concerns	<ul style="list-style-type: none"> <li>• The seedlings and flower traders in Ruiru, who are mostly women, expressed concern about displacement by the proposed project. They indicated that they would not find a suitable place to conduct business during the construction period. They requested to be adequately compensated;</li> <li>• The community requested the consultants to ensure that all construction sites are appropriately restored to enable them to resume their business operations at the end of construction with ease;</li> <li>• The shop owners emphasized the need for adequate compensation to enable them to cater for the loss of business during construction, and for the cost of reconstructing any damaged or destroyed stalls once construction ends;</li> </ul>

S/No.	Aspect	Comments
		<ul style="list-style-type: none"> <li>The locals requested for ample notice from the proponent to vacate the site prior to site clearance and preparation activities; and</li> <li>The community urged the proponent to adhere to construction timelines to minimize inconveniences during construction.</li> </ul>
4.	Project Design	<ul style="list-style-type: none"> <li>Some locals were of the opinion that areas under the coverage of the Nairobi Water and Sewerage Company supply should benefit from the proposed supply of RUJWASCO as opposed to phasing out the former; and</li> <li>In Kahawa Wendani, the community felt that the proposed project should have included a sewer line since waste water disposal is a challenge in the area.</li> </ul>
5.	Stakeholder Engagement	<ul style="list-style-type: none"> <li>The community advised that the Contractor should work closely with <i>nyumba kumi</i> structures at the grass roots level and the elders to enhance community project acceptability and for the safety of the project property.</li> </ul>

Source: Field Survey, 2017

## 6.8 INCLUSION OF OUTCOMES OF STAKEHOLDER ENGAGEMENT IN THE FINAL DESIGN OF THE PROJECT

### 6.8.1 Mitigation of negative impacts

Some of the stakeholders expressed fears that the project will cause many negative impacts such as increased waste generation, noise, exposing soils thus making them prone to soil erosion, occupational health and safety issues such as construction accidents, disruption of income streams especially for the women who earn their living from the road side, traffic snarl up, interference with water supply from the Jacaranda abstraction point and physical displacement especially for the seedling and flower traders in Ruiru, among others.

The Project design has aimed at avoiding the negative impacts where possible. Where avoidance has not been possible, a number of measures have been incorporated in the project design to minimise their significance. In addition, the contractor will be required to implement the mitigation measures identified in this ESIA report to further minimise all the negative impacts to acceptable levels.

### 6.8.2 Employment Opportunities for the Public

The community expressed the need for the contractor to give the first priority to the local community members during the recruitment of both skilled and unskilled labour.

It is also in the interest of the developer to employ local community members provided that they have the required skills and experience to undertake the tasks that will be at hand. This requirement will be included in the contractor's

contract. Although the exact number of employment opportunities that will be available during both the construction and operational phases are not yet determined; the construction phase will be present a number of unskilled and semi-skilled job opportunities which can be taken up by the local community members.

### **6.8.3 Socio-economic development of the project area**

The local community members hope to have increased income streams once the project has been implemented such as operating water kiosks, supplying food to the construction workers.

The project will definitely avail the above opportunities and it will be upon the interested local community members to prepare and harness them.

### **6.8.4 Adequate compensation**

The shop owners emphasized the need for adequate compensation to enable them to cater for the loss of business during construction, and for the cost of reconstructing any damaged or destroyed stalls once construction ends.

The compensation for the proposed project will be guided by the abbreviated RAP prepared.

### **6.8.5 Adequate notice and adherence to the construction schedule**

The local community members requested for ample notice from the proponent to vacate the site prior to site clearance and preparation activities. More so, the community members urged the proponent to adhere to the construction timelines to minimize inconveniences during construction.

The local community members will be kept updated as much as appropriate and possible. A project schedule has been developed and it indicates that the construction activities will be completed within a period of two years and the first year of the operation phase will be a defects period. Upon signing of a contract with the contractor, the developer will require the contractor to adhere to the proposed timeline as much as possible. Any alterations to the project implementation schedule will be justified and communicated in advance.

### **6.8.6 Inclusion of a sewer line**

Some of the local community members proposed the inclusion of a sewer line since waste water management is a challenge; however, the proposed project aims at ensuring availability of potable water. The provision of a sewer line has therefore not been considered for this project.

### **6.8.7 Areas covered by the project**

Some locals were of the opinion that areas under the coverage of the Nairobi Water and Sewerage Company supply should benefit from the proposed supply of RUJWASCO as opposed to leaving them out.

The project design considers all the areas within the project area whether currently being supplied by Nairobi Water and Sewerage Company or not. However, for the areas currently being supplied by Nairobi Water and Sewerage Company, it will be an enhancement to ensure constant supply of water.

#### **6.8.8 Working with *Nyumba Kumi***

The local community members advised that the Contractor should work closely with *nyumba kumi* structures at the grass roots level and the elders to enhance community project acceptability and for the safety of the project property.

This has been noted as a key local stakeholder and it has been recommended that the contractor collaborates with them to ensure project acceptance by the local community members and success.

### **6.9 STAKEHOLDER ENGAGEMENT PLAN (SEP)**

The implementation of the proposed Ruiru-Juja Water Supply Project requires the involvement of a diverse range of stakeholders, all with a substantial capacity to influence and inform project decisions. The geographical scope, nature and impact of activities envisaged coupled with the diversity of the social setting within which the project is being designed, necessitates the involvement of a range of stakeholders in the planning, design, grievance management, construction, operation and sustainability of the project.

The development and implementation of the Environmental and Social Management Plan (ESMP) may benefit from a multi-sectoral approach in achieving the intended objectives. For this reason, the stakeholders identified in this ESIA should be continuously engaged and updated of the project activities at all times. This stakeholder engagement strategy will apply to all project phases and all third parties e.g. sub-contractors will be expected to adhere to this plan as they execute their duties. It is important to note that stakeholders are dynamic and may change during the course of project implementation; therefore, the stakeholders identified should be periodically reviewed and the list updated to remove stakeholders who will have become irrelevant to the project and add new ones who will have become relevant stakeholders.

The predicted impacts to the physical, biological and social environment as a result of the proposed Project are described in this *Chapter*. This *Chapter* also details recommended mitigation measures in order to avoid, minimise, reduce, remedy or compensate for potentially negative impacts, and enhance potential benefits of the proposed Project.

Furthermore, this *Chapter* provides a prediction of the residual impact that will remain, assuming that the appropriate mitigation measures are implemented. The development of mitigation/management measures and the management of residual impacts are fully described in the Environmental and Social Management and Monitoring Plan (ESMMP).

### **7.1 IMPACT ASSESSMENT APPROACH AND METHODOLOGY**

Both positive and negative impacts are identified for both the construction and operations phase. For each impact, a summary of the existing baseline environment that will be impacted is presented followed by a summary of the project activities that will cause the impact. Appropriate mitigation measures are then outlined to minimise the severity of each of the negative impacts to acceptable levels. For the case of positive impacts, enhancement measures are identified to maximise the benefits from the Project.

Significant impacts are defined, not necessarily in order of importance, as being those which:

- Result in Loss of property and of livelihood.
- Relate to protected areas or to historically and culturally important areas;
- Are of public concern and importance.
- Trigger subsequent secondary impacts.
- Elevate the risk to life threatening circumstances.
- Affect sensitive environmental factors and parameters.

The predicted impacts on the physical, biological and socio-economic environments are:

#### **Positive Impacts**

- Impacts on employment, procurement and the economy;
- Improved accessibility to clean and reliable water supply;
- Improved hygiene in the project areas;
- Reduced cases of water related diseases;
- Reduced water and sanitation burden to women; and
- Increased land values in the project area.

#### **Negative Impacts - Construction Phase**

- Impacts on water quality;



- Impacts on local air quality;
- Impact of habitat loss and degradation;
- Impacts from noise and vibration;
- Impacts from wastes and effluents;
- Loss of agricultural land;
- Traffic impacts;
- Community health, safety and security;
- Labour and working conditions including workers' health and safety;
- Impacts on cultural heritage;
- Loss of business and income;
- Increased transmission of HIV/AIDS; and
- Disruption of public utilities.

### **Negative impacts - Operation Phase**

- Impact on River Ruiru surface flow;
- Impacts on water quality;
- Potential impacts during repair and maintenance works; And
- Increased waste water generation in the Project Area due to improved water supply.

### **Climate Change Related Impacts**

In the long run, the proposed project once implemented will help the local community members to adapt to two climate change impacts. These are:

- Impacts of forecasted temperature increases; and
- Impacts of forecasted increase in precipitation.

However, the proposed project is likely to be affected by the impact of forecasted changes in the magnitude and frequency of extreme climatic events associated with climate change in the long run.

The proposed project will have a net neutral impact on greenhouse gas emissions.

### **Decommissioning phase impacts**

All these impacts are assessed in details below. This also includes the identification of appropriate mitigation measures which are presented for each of the identified negative impacts. Measures to enhance the positive impacts have also been identified and included under the respective positive impacts.

Each of the above impacts are assessed in details below.

## 7.2

### CONSTRUCTION PHASE IMPACTS

#### 7.2.1 Impacts on Employment, Procurement and the Economy;

The population of Ruiru, Juja and Githurai Areas, here in referred to as the Social Area of Influence (SAoI) were observed to be primarily self-employed. A majority of the young people in the areas were reported as being unemployed, some of them, however, engaged in informal temporary labour as and when opportunities arise. The majority of the interviewed persons are semi-skilled, while a smaller proportion is unskilled.

Construction phase activities will include; site clearance, excavations, general construction, assembly, site security and site rehabilitation. The construction phase of the Project will create direct employment opportunities across different skills levels, from unskilled to highly skilled labour.

The main impacts from the Project will include direct employment opportunities during construction, indirect employment generated by the procurement of goods and services for the Project, and induced employment related to jobs ensuing from the expenditure of incomes associated with direct and indirect Project related jobs.

An additional direct benefit during the construction phase is the opportunity for 'on-the-job' training for local people. The highly skilled technicians can provide training to local employees, increasing their skills level so that they will be employable on other Projects.

The main receptors in the SAoI that may be able to make the most of the direct and indirect employment opportunities and the procurement of goods and services, are those who have some experience of formal employment, those who have gained a basic education or who have learnt English language skills.

#### *Enhancement Measures*

In order to enhance this positive impact, the following management measures will be required:

- The Project will prioritise the employment of unskilled labour from the affected villages and towns in the first instance. The advertisements on the employment and procurement opportunities during construction phase should be placed at the Chiefs' Offices for information. In the event that positions cannot be filled from within these villages and towns it should be advertised further afield (county-wide, then nationally).
- The Project should prioritise the procurement of goods and services from within the nearby towns of Juja, Ruiru and Nairobi. In the event that goods and services cannot be procured from within the county, then preference should be given to national companies. This will not apply to the provision of specialised technical goods, which will be sourced from overseas, but applies rather to construction materials, such as cement, sand, aggregates, reinforcing steel, metal etc.

- The Project should develop a fair and transparent employment and procurement policy and processes that manage any potential nepotism or favouritism. The policy should be shared with the nearby communities.
- The Proponent will include requirements for local employment in the contract that they establish with the contractor and require that the contractor recruits in accordance with the Proponent recruitment policy and RFP documents.
- The Proponent should ensure that all tenders are advertised.

### **7.2.2 Impacts on Water Quality**

Ruiru River is the main surface water within the footprint of the Project Site. However, along the proposed water transmission footprint, other streams and seasonal rivers have been identified. Consultations with some of the households along the footprint, and the Village Elders indicated that these rivers and streams are reliable sources of water for domestic use to a number of households.

The proposed Project will involve removal of top soil, pipeline excavation and soil compaction during the construction phase. Some of these activities may be proximal to the identified water bodies. Potential erosion of the loose or bare soil surfaces with surface run off into these water bodies may increase the sediment load of adjacent rivers and streams. More so, there is a possibility of run-off containing petroleum contaminants (fuel, lubricants and used oil) especially if there are leakages from the project machinery and equipment.

In addition, compaction of the ground from construction equipment will lead to increased surface runoff and directed flow due to decreased infiltration capacity of compacted soils. Through percolation of contaminated waters, underground water in the AoI may be degraded too.

The above impacts may degrade the quality of river and underground waters and pose health risks for other users as well as risking the aquatic life therein.

#### *Mitigation/Management Measures*

- Where possible construction activities close to these rivers should be scheduled for the dry seasons. In this regard, the developer and Contractor will be cognisant of local weather forecasts and the seasonal climate characteristics of the Project Site.
- The removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. In particular, the unnecessary removal of groundcover vegetation from the AoI will be avoided.
- Disturbed areas will be rehabilitated as soon as possible to prevent erosion.
- Fuel, oil and used oil storage areas will be contained in bunds of 110% capacity of the stored material. Fuels will be stored in above-ground storage tanks.

- Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of.
- Construction vehicles and equipment will be serviced regularly and off site.
- Construction vehicles will remain on designated and prepared compacted gravel roads.
- Any drainage lines on working sites will be covered with appropriately designed culverts so as to result in zero impedance to natural surface water flows.

### **7.2.3 Impacts on Local Air Quality**

The project infrastructure route is located in a predominantly settled area where the main air pollution activities include industrial activities and vehicle movements along the road. During site visit activities, dust emissions by trucks were observed.

During the construction phase, the main sources of air pollution will be soil excavations which raise particular particulate matter (dust) within the Project AoI. More so, transportation of Project materials and equipment will be associated with dust emissions along the access roads especially on murrum roads.

In addition, exhaust emissions from the construction equipment and machinery are expected to include CO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub> and volatile organic compounds, since most of them will be powered by diesel/ petrol engines. However, these will be in very small quantities since light construction activities are expected, mainly associated with the preparation of the foundations and pipeline excavation.

Given the location of the proposed Project Site and the localised nature of dust emissions, the main receptors of this impact will be the construction workers, other road users and some nearby settlements and institutions, including health centres and schools.

#### *Mitigation/Management Measures*

- Spraying water on soil before excavation and periodic access road wetting to reduce nuisance dust levels.
- Visual inspection of dust pollution from roads and the construction site and appropriate intervention if dust levels are high.
- Speed restriction of construction vehicles to a speed of 30 km/h or less on the site and on the access roads to the site.
- Maintenance and servicing of machines and engines off-site.
- Refuelling from authorised fuel stations.
- Grievance procedure for dust complaints.
- The use of appropriate Personal Protective Equipment (PPE) such as dust masks, in particular, for construction workers.
- All construction materials will be transported in designated trucks which will be covered.

#### **7.2.4 Impact of Habitat Loss and Degradation**

Riparian vegetation associated with Ruiru river and other seasonal rivers in the project area is considered the most sensitive vegetation in the Project area. These habitats might be affected by laying of project infrastructure, creation of access roads and material sourcing routes.

##### *Mitigation/Management Measures*

- Riparian vegetation associated with the rivers passing through the Project area is considered sensitive and provides important ecosystem services. Development of infrastructure and cultivation areas must avoid a recommended 30-60 meter buffer of these habitats which include rivers Ruiru, Bathi, Gatamayu, Mukuyu and Thiririka.
- When creating access routes, focus on the already used routes to avoid increasing project footprint and affect more biodiversity habitats.
- When locating soil material borrow sites, give priority to the existing sites before entry into new sites. If none is already available, select the sites away from the riparian and focus more on already modified habitats as opposed to natural habitats. Also, limit the footprint of operation at such sites.
- Construction activities must be managed to minimise the footprint of these activities through a process of planning in advance and demarcating areas on the ground for contractor's facilities, equipment laydown, vehicle parking and/or other requirements that could cause unintentional expansion of construction footprints.
- Induction programmes for staff, contractors, visitors and other personnel must include requirements to protect the natural environment and provide an overview of the compliance measures expected of every person to avoid impacts to the environment.

#### **7.2.5 Impacts from Noise and Vibration**

Noise levels at some sections of the Project footprint are low and insignificant due to the rural nature, and relatively high on other sections, especially around Githurai Area due to increased settlements and human activities. The construction activities that will be associated with noise emissions and vibrations are vehicular movements, operation of the construction equipment and machinery and excavation activities. The primary sensitive receptors for the noise and vibration impact will be the construction workers, social institutions like nearby schools and health centres. Along the access road, the main receptors will be other road users and settlements along the access roads.

##### *Mitigation/Management Measures*

- All construction equipment and machinery will be well maintained as per the manufacturer's requirements and whenever noticed to be malfunctioning to avoid unnecessary noise emissions.
- All the construction activities will be limited to day time hours only (07:00 am to 6:00 pm).

- Bill boards will be erected at the construction sites notifying people of the construction activity and timings.
- A speed limit of 30km/h will be imposed on all vehicles transporting construction equipment and materials.
- A grievance procedure for noise complaints will be prepared and implemented.
- A construction Health and Safety plan that will outline all health and safety risks and which will provide a strategy for their management will be developed. The Contractor will be required to adhere to this Plan and meet the requirements of the Occupational Health and Safety Act of 2007.
- A construction emergency plan will be prepared and implemented.
- Appropriate Personal Protective Equipment (PPE) including earmuffs will be provided to all the Project employees and training on their use.
- Unnecessary idling of project vehicles and, equipment and machinery will be avoided.

### **7.2.6 Impacts from Wastes and Effluents**

The Project footprint is located partly in significantly populated areas. Poorly managed wastes from project activities would therefore affect nearby households and institutions. At the time of the site visits, no waste or effluent was observed within rural sections of the project footprint, mostly dominated by farmlands and thickets. However, based on the current land use of the sections of the footprint falling within the greater Githurai area, the main waste generated is largely domestic and biodegradable attributed to the increased density of settlements and varying livelihood activities.

During the construction phase, general wastes produced will include: plastics, metal and wood, cement, paper, paints and sealants. In addition, waste oil from the construction equipment and machinery will also be produced. The sensitive receptors of these wastes and effluents will be Project workers, farmers and other residents of the project area. Effluents may also find their way to the nearby soils, rivers and streams, thus degrading the soils and reducing the water quality of these Rivers.

#### *Mitigation/Management Measures*

- A Waste Management Plan (WMP) will be produced for the construction phase following the principles of waste minimisation at source, segregation for reuse, recycling, and disposal of waste.
- The Contractor will adequately allocate responsibilities for waste management.
- The Contractor will ensure wastes are handled by personnel licensed to do so especially in the case of hazardous waste.
- The Contractor will make suitable facilities available for the collection, segregation and safe disposal of the waste, also ensuring wastes are not blown off site by winds contributing to wind-blown litter in the area.
- The collection of wastes that cannot be reused or recycled will be collected by approved waste contractors and transferred to an appropriately (NEMA licensed) waste management facility for treatment and ultimate disposal.

- Fuels will be stored on site in temporary aboveground storage tanks.
- Trucks and construction vehicles will be serviced off site.
- The use, storage, transport and disposal of hazardous materials used for the project will be carried out in accordance with all applicable Kenyan regulations, and Material Safety Data Sheets (MSDS).

### **7.2.7 Loss of Agricultural Land**

Some of the land that will be traversed by the Project infrastructure is agricultural. This is mainly at the beginning of the transmission line in Juja and Ruiru areas where extensive privately owned coffee and flower farms are identified. Other farmlands were fallow and planted with grazing grass at the time of the site visit. The latter areas of Kahawa and Githurai are mostly dominated by settlements and structures, both residential and industrial.

Transmission line excavation and rehabilitation works will affect portions of these lands. It is anticipated that the sections required for the project will only be temporarily acquired, and the land owners will be able to use the surface areas after construction. The main receptors of this impact will be the individual and corporate owners of these farmlands.

#### *Mitigation/Management Measures*

- The Proponent will implement a RAP prepared for the Project.
- The Proponent will engage with the affected land owners on a continual basis regarding the construction process; this is to ensure activities on their land are not impacted during the construction period.

### **7.2.8 Traffic Impacts**

The study area is serviced by the Thika Super highway connecting Nairobi and Thika towns. More proximal to the footprint are the Thika-Gatundu road, Thika-Limuru road, Nairobi Northern Bypass and many other access roads to the coffee estates, residential and industrial sites. During construction phase, various trucks will be expected to deliver materials and structure at various sections of the project footprint. Other personnel vehicles and heavy equipment will also be using these roads, especially the access roads.

The risk of injuries from road traffic accidents will increase during civil construction work associated with the movement of equipment and people by road. The increase in traffic could also create noise, dust and safety (including injury or even death due to accidents) impacts for other road users and people living or working within close proximity to the roads on the selected transport routes. This will particularly be the case if informal traders and Motor Cycle taxi riders best known as *Boda bodas* increase their presence around Project access roads and sites.

### *Mitigation/Management Measures*

- During construction, arrangements and routes for abnormal loads (if required) will be agreed in advance with the relevant authorities (Kenya National Transport Safety Authority, NTSA and Kiambu County government) and the appropriate permit will be obtained for the use of public roads. However, it is anticipated that transport will be carried out with standard containers.
- The Contractor will develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations.
- The Contractor will require Project drivers to be trained in defensive driving within the previous 3 years.
- All vehicles used for the project should be regularly serviced and maintained.
- Speed limits (of less than 30 km/h) should be adhered to on the Project site.
- The Contractor will undertake consultations with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes, put up road signs such as "Heavy Trucks Turning Ahead" and warn *Boda Bodas* and other vehicle users along the project access roads of danger/ risk of accidents occurrence ahead.
- A grievance procedure, as outlined above, will be established whereby any complaints by neighbours or affected parties are recorded and responded to.

### **7.2.9 Community Health, Safety and Security**

Most of the upstream project sections lie on privately owned and well secured agricultural lands, right up until the Ruiru area. From here, the project runs through settlements and in between private properties and urban open lands right to the very end. This downstream section of the project, encompassing Ruiru, Kahawa Sukari, Kahawa Wendani, Mwihoko, Githurai, Mwiki, faces safety challenges from other projects, as well as security challenges at present, as reported by the Chiefs and other consulted persons.

Construction activities such as moving equipment and heavy materials, open excavations, project processes will generate wastes, traffic risks, noise and particulate dust above the ambient levels to local communities and other road users and visitors in the settled areas, among others. Other health and safety risks include the risk of injuries to project personnel from general construction work, such as the ergonomics and use of heavy lifting equipment, and the risk of fire.

### *Mitigation/Management Measures*

- Maintenance of equipment to ensure it remains efficient and effective.
- Construction works only during day time.
- Provision of bill boards at the construction sites notifying people of the construction activity and timings.
- Immediate rehabilitation of completed work sites.
- Speed limits within the project site access roads and vicinity.



- Grievance procedure for noise complaints.
- Implementing a construction Health, Safety and Security plan that will outline all health and safety risks including for both community and the Contractor security issues and which will provide a strategy for their management.
- Preparation of construction emergency plan.
- Provision of adequate personal protective equipment (PPE) to workers and training on its use as required.
- Strict use of warning signage and tapes where the trenches are open and at other active construction sites.
- Quarterly audits by a third party contractor to ensure H&S and Security issues are effectively implemented in accordance to national H&S regulations and, World Bank ESS 2 (Labour and Working Conditions) and 4 (Community Health and Safety).

### **7.2.10 Labour and Working Conditions including workers' health and safety**

Most of the adults in the Project-affected communities are self-employed, mostly living off informal businesses, and farming. This is primarily because of unavailability of better employment alternatives, as they cannot adequately meet their daily financial needs from their current engagement. Furthermore, most of the community members mentioned that it is more difficult to find employment opportunities now, and are not hopeful that this situation will be any better in the next five years.

The Project aspects that have primary relevance to these impacts include:

- Worker recruitment and employment criteria and procedures.
- Workers supervision and management.
- Workers' occupational health and safety conditions.
- Working area conditions.
- Retrenchment and dismissal.

Sensitive receptors may include employees who have a poor understanding of the requirements of OHS standards and their labour rights as enshrined by law.

Labour and working conditions, including occupational health and safety, will need to be considered to avoid any incidents and/or injuries. Issues that need to be considered include: fair treatment of workers, non-discrimination, equal opportunities, as well as the provision of a safe and healthy working and living conditions. These issues should be considered not only for those employed directly by the Proponent, but also employees of the Contractor and any other sub-contractors during construction and operation.

Without careful management, the workforce employed may be exposed to occupational health and safety risks as a result of insufficient health and safety standards, potentially resulting in injury or death.

This section will focus on both **construction** and **operational** phases of the Project due to the applicability of the labour conditions throughout the Project cycle.

It is important to note that while the labour laws exist, there are issues with regards to implementation. Also due to the lack of employment in Kenya, workers are willing to sacrifice their rights in order to secure employment. There is therefore the risk that the Contractor and sub-contractors will not operate in line with international best practice if measures to manage such risks are not enforced.

### *Mitigation/Management Measures*

#### Management System

The Project will develop a Human Resources Policy which the contractor will be expected to adhere to through its policies and procedures. This will include a Labour and Employment Plan and Worker Grievance Mechanism. These requirements will also be passed on to any sub-contractors. Key issues with the HR management will include, but not be limited to the following:

- Provision of clear and understandable information regarding rights under national labour and employment law, and any applicable collective agreements, including those related to hours of work, wages, overtime, compensation, etc.
- Provision of reasonable working conditions and terms of employment.
- Provision of employment, compensation/remuneration and working conditions, including working hours, based on equal opportunity and fair treatment, avoiding discrimination on any aspects.
- Provision of adequate welfare facilities on site.
- Implementation of a grievance mechanism.
- Adoption and implementation of a sexual harassment policy.
- Adoption of open attitude towards freedom of association.
- Provision of all workers with appropriate Personal Protective Equipment (PPE).

#### Workers' Rights

- The Proponent will put in place hiring mechanism to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation.
- All workers (including those of contractors and subcontractors) will, as part of their induction, receive training on worker rights in line with Kenyan legislation to ensure that positive benefits around understanding labour rights are enhanced. This process will be formalised within the Code of Conduct that will be provided by the Proponent.
- All workers (including those of contractors and subcontractors) will have contracts which clearly state the terms and conditions of their employment and their legal rights. Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights.

Contracts must be in place prior to workers leaving their home location if applicable.

- The Proponent and the Contractor will put in place a worker grievance mechanism that will be accessible to all workers, whether permanent or temporary, directly or indirectly employed. The Proponent worker grievance mechanism shall be open to the Contractor and subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer. The Proponent will then have the authority to act to resolve this grievance.
- All workers (including those of the contractor and subcontractor) will have access to training on communicable diseases and STDs and community interactions in general. This training will be developed in collaboration with local health institutions.
- Implement international guidelines regarding the construction and management of worker accommodation.
- Surveillance and assurance that no children or forced labour is employed directly, by the contractor, and to the extent possible by third parties related to the project and primary suppliers where such risk may exist.

### **7.2.11 IMPACTS ON CULTURAL HERITAGE**

The Project infrastructure is generally sited on a largely modified habitat, but due to the fact that the project will involve excavation, there is potential to come across locations or items of archaeological or cultural significance.

#### *Management Measures*

The contractor should develop and implement a chance find procedure in case archaeological sites/cultural heritage sites are found during the construction process. Such procedure must incorporate liaison with the National Museum of Kenya.

### **7.2.12 LOSS OF BUSINESS AND INCOME**

A number of structures will have to be demolished to enable implementation of the project which will result to various impacts including:

- Loss of business when relocating to the new business premises.
- Considerable loss of contact with already established customers/ clientele; and
- Loss of strategic business location;

From interviews with PAPs, it was noted that they will be affected in the following ways:

- Loss of business structures required for development in the proposed relocation site;
- Loss of livelihoods of all persons conducting businesses within the business premises; and
- Other losses identified above.

#### *Management Measures*

- Compensation at full replacement cost for affected structures;

- Athi water services Board should liaise with existing NGOs organising training for the PAPs who would have lost their businesses as a way of livelihood restoration programmes;
- The developer, AWSB, should set aside a livelihood restoration fund for use in restoring the PAPs' livelihoods in addition to full compensation; and
- The developer, AWSB, should develop and implement a Livelihood Restoration Plan (LRP). The LRP should include feasible livelihood restoration interventions identified with the involvement of the PAPs.

### **7.2.13 INCREASED TRANSMISSION OF HIV/AIDS**

The project will attract new people to the project area seeking employment during the construction period and this can lead to increased transmission of HIV/AIDS and other sexually transmitted diseases (STDs) as they engage in sexual relationships amongst themselves and/or local community members. This impact applies to all the project areas under this assessment that is Kahawa Sukari, Kahawa Wendani, Kiuu A, Kiuu B, Mwiki, Mwhoko A and Mwhoko B.

#### *Management Measures*

- HIV/AIDS awareness program will be instituted and implemented as part of the Contractor's Health and Safety Management Plan. This will involve periodic HIV/AIDS awareness workshops for Contractor's Staff;
- Access to Contractor's workforce camps by outsiders will be controlled; and
- Contractor will provide standard quality condoms to personnel on site.

### **7.2.14 DISRUPTION OF PUBLIC UTILITIES**

The proposed project will affect other public utility infrastructure which include, existing data cables, plot access culvers, existing water and sewerage infrastructure, internal roads within the project areas, electricity transmission lines and storm water drainage channels. This impact applies to all the project areas under this assessment that is Kahawa Sukari, Kahawa Wendani, Kiuu A, Kiuu B, Mwiki, Mwhoko A and Mwhoko B.

#### *Management Measures*

- The Contractor will carry out piloting to locate services such as pipes and cables along the Pipeline Route before commencing excavation works;
- The relevant Services Providers and Agencies (KeNHA, KURA, KeRRA, NCWSC, Kenya Power, etc.) will be notified prior to commencement of the project works so that any relocation works can be carried out before the pipeline construction works begin;
- Road crossings of all major paved roads will be done through trenchless methods (tunnelling under the road surface) to avoid disruption to traffic flow; and
- The length of excavation will be restricted to sections that can be reinstated within the shortest period possible to minimize time of disruption of services.

## **7.3 OPERATIONS RELATED IMPACTS**

### **7.3.1 Impacts on Employment, Procurement and the Economy**

The project will release most of the construction phase employees. Only a few employees will be retained for this phase. The majority of these positions will be skilled. However, there will also be a limited number of semi-skilled and unskilled opportunities. As with the construction phase where possible priority will be given to locals in order to maximise local employment.

### **7.3.2 Improved Accessibility to Clean and Reliable Water Supply**

The project priority areas currently have insufficient improved sources of water and as a result, many of them resort to unimproved water sources. The overall objective of this project is to increase on the number of improved water sources through the abstraction and supply of 13,000 m<sup>3</sup>/day. As part of the project, a total of 8,400 consumer water meters (6,300 DN 15 c/w box and 2,100 DN 25 c/w box) are planned for installation in the project priority area. this will significantly increase the number of improved water sources.

### **7.3.3 Improved Hygiene in the Project Areas**

Good Hygiene Standards are directly linked to provision of reliable and adequate water supply. The Project target areas will directly benefit from improved hygiene as a result of improved water supply.

### **7.3.4 Reduced Cases of Water Related Diseases**

Connected to improved hygiene and sanitation, improved access to clean potable water will significantly reduce the prevalence of water borne diseases. This will effectively reduce related medical expenses among the people in the project area with extended long term increased social productivity.

### **7.3.5 Reduced Water and Sanitation Burden to Women**

In most cases, the burden of collecting water to the households is the responsibility of women. More so, the burden of caring for the sick including those who suffer for instance from water related illness is also left to women. Availability of reliable potable water sources in the Project Area will lessen this burden and also ensure enhanced family health.

### **7.3.6 Increased Land Values in the Project Area**

Provision of any infrastructure is an additional value for properties in target areas of the greater Githurai area. It is expected that property and land will appreciate because of improved access to potable water. Therefore, local community members selling land will fetch more once the project has been developed.

### 7.3.7 Impact on River Ruiru Surface Flow

River Ruiru is the main water source for the Juja and Ruiru towns. The river water also supplies the adjacent farms, some institutions and nearby households. The project proposes an increase in volume of water abstracted from the river into the Jacaranda Treatment Plant. This will reduce the available residual flows on the river.

Increased abstraction of water from the river may have impacts on allowable environmental flows, especially during dry seasons, and water availability for downstream users.

River Ruiru flow duration analysis indicates the following flow thresholds (Refer to a copy of the hydrology report attached for more details):

- Reserve Flow (Q95) - 0.336 m<sup>3</sup>/s (29,030.4 m<sup>3</sup>/day).
- Normal Flow (Q80) - 0.814 m<sup>3</sup>/s (70,329.6 m<sup>3</sup>/day).
- Flood flow threshold (Q50) - 2.039 m<sup>3</sup>/s (176,169.6 m<sup>3</sup>/day).

This implies that the volume of the water in the river is much more than the design flow of 28,000 m<sup>3</sup>/day (currently permitted 13,000m<sup>3</sup>/day + additional required 15,000m<sup>3</sup>/day) even during periods of low flows.

It is also important to note that the Water Resources Authority (WRA) controls water uses specifically abstraction along rivers and is expected to consider all other water users before issuing a water abstraction permit for any water abstraction project to ensure that sufficient environmental flow is maintained.

#### *Mitigation/Management Measures*

- The developer should apply for a variation of the existing water abstraction permit to increase the permitted water abstraction from 13,000 m<sup>3</sup>/day to 28,000 m<sup>3</sup>/day.
- The developer should observe the minimal legal environmental flows that will be included in the water abstraction permit while abstracting water for the project.
- The developer should continuously monitor the amount of water abstracted for the project as well as residue flow. Where necessary, the amount of water abstracted should be slightly reduced to ensure that the recommended minimum environmental flow (to be stated in the water abstraction permit once it has been obtained from WRA) is maintained at all times.
- In liaison with the WRA and other relevant agencies such as the Kenya Forest Services (KFS), the developer should contribute towards protecting the sub-catchment of River Ruiru. In particular, these should be in protecting the remaining pockets of forest cover and bushlands in the upper zone within the protected forest zone.

### **7.3.8 Impacts on Water Quality**

Same as that described for the construction phase under *Section 7.2.2* (Impacts on Water quality). During the operational phase, the project activity that will cause a reduction in water quality is periodic repairs which might result in soil spoil or oil leakages into the groundwater aquifers and/or flow to the nearby Rivers or storm water drains.

#### *Mitigation/Management Measures*

- Activity areas used during repairs will be re-vegetated with indigenous vegetation to prevent erosion immediately after these areas are no longer required for construction.
- The Health and Safety Plan developed during construction phase will be applied during all repairs.

### **7.3.9 Increased Waste Water Generation in the Project Area due to Improved Water Supply**

Improved Water Supply to the Project Area is likely to result in increased generation of waste water. Larger volumes of waste water, if not handled and disposed properly, can create an environmental and health hazard in areas without adequate water borne sewerage systems especially in the low to medium class areas of the greater Githurai area.

#### *Mitigation/ Management Measures*

- Improved sanitation to be provided in Areas without adequate sanitation systems. This includes promotion of the use of septic tanks and soak pits in areas not connected to the sewer line.
- NCWSC should conduct regular inspection and maintenance of the existing Sewerage Systems in the Project Area to ensure they are in good working condition. This is particularly critical in Informal Settlements and Low Income Areas where blockage of the Sewerage Systems is most likely.

## **7.4 CLIMATE CHANGE ASSESSMENT SUMMARY**

With the aim of sustainability and avoiding adverse environmental, social and climate impacts and risks, KfW Development Bank requires the consideration of the probable and foreseeable impacts of climate change, including utilising the potential to adapt to climate change. In this context climate change is understood as climate variability and long-term climate change.

The in-depth climate adaptation assessment and consideration of the aspects related to climate change adaptation (climate resilience) should ensure that the

desired developmental impacts of the FC measure are not endangered despite the forecasted effects of climate change.

From the assessments done during the project Feasibility Study, it is evident that temperatures in Kenya will show a significant rise due to climate change, and annual rainfall could vary widely from quite a significant reduction, at least in the long-rains, to a pronounced increase. Four rainfall scenarios are considered possible, all associated with an annual average of 0.2°C temperature rise:

- A worst case scenario based on FewNet 2010 and AR4 minima with decreases in rainfall from 3% between September and February, by 9% between March and May, by 18% between June and August and by 10% between September and November, when compared to pre-1980 data.
- An 'as is' scenario where there is little, if any, change in future rainfall from the pre 1980 situation.
- A 'likely' scenario based on the forgoing where rainfall increases by 13% between December and February, but decreases by 6% between March and May, by 4% between June and August, and shows little if any change between September and November.
- A best case scenario (AR4 50% likelihood) where rainfall increases by 13% between December and February, by 6% between March and May, by 4% between June and August, and by 7% between September and November.

In general, it is reported that the overall impacts of these changes on the water resources will be largely determined by changes in the magnitude and frequency of extreme climatic events such as droughts and floods, rather than normal variations.

#### **7.4.1 Impacts of forecasted temperature increases**

Forecasted temperature increases will have no impacts on the functioning of the system because the temperature rises are not so significant and the system is designed to be operated under a broad range of conditions.

Increased temperatures are likely to lead to a higher demand for water by the population. Hence, the increased water supply enabled by the project will help the population adapt to climate change by providing them with more water.

#### **7.4.2 Impacts of forecasted increase in precipitation**

Forecasted precipitation increases will help ensure the minimum flow in Ruiru River and so safeguard the abstraction of the required amount for drinking water, whilst leaving sufficient quantities in the river for other users and the environment.



### **7.4.3 Impacts of forecasted changes in the magnitude and frequency of extreme climatic events**

The most significant extreme climatic events for the project would be increases in the frequency or extremity of dry periods or droughts, which would affect the flow in the Ruiru River and hence could affect abstraction and supply of sufficient water to meet demand. This could also be the outcome if the worst case scenario becomes correct, i.e. there is a definite downward trend in the long-rains.

#### *Management Measures*

- The completion of the Karimenu 2 and Ruiru 2 Storage reservoirs, both of which have commenced construction under separate contracts, will help ensure water availability and river flows during dry period. However, for the short interim period until these are completed, abstraction for the project could be affected by exceptional low flows in the Ruiru River due to dry periods;
- It should in any case be noted that controlling illegal abstraction from the river is considered more significant for ensuring minimum flows, for which the Water Resources Management Authority (WRMA) should be engaged. Further to this, the developer should work with the Kenya Water Towers Agency to foster water catchment management for all the sources of water feeding into the project; and
- To ensure abstracted water is used most efficiently, all consumers will be fitted with accurate water meters. In addition, the wastage of water through leakage from the new system will be minimised through the specification of high quality construction materials, and with stringent tests applied during construction. The establishment of district metered areas, with bulk water meters, and the supply of O&M equipment to the WSP, will also help ensure leaks can be quickly found and repaired.

### **7.4.4 Greenhouse gas emissions from project**

During construction there will be greenhouse gas emissions from construction vehicles and plant. To mitigate this the workers shall be trained on management of air pollution from vehicles and machinery. Also all construction machinery shall be maintained and serviced in accordance with the legal requirements and the contractor's specifications.

During project operations greenhouse gas emissions will be increased due to increased pumped abstraction from the intake and increased treatment of water at the water treatment plant, though the transmission and distribution systems are all gravity supply. However, these emissions from abstraction and treatment will be offset by the decrease of people in the area having to use water tankers or private vendors for water supply, because the new centralised water supply system will be more efficient.

## **7.5 CUMULATIVE IMPACTS**

Cumulative impacts are a result of effects that act together (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the project under consideration (e.g. the combined effect of other similar projects in the general area). An effect to a resource in itself may not be considered significant, but may become significant when added to the existing and potential effects eventuating from similar or diverse developments in the area.

There have been ongoing water and sanitation projects around Githurai area. These projects are aimed at improving the sanitation standards in the residential sections of this area, especially on sewage management. Though these projects also require land and working space, they are not proximal to the proposed infrastructure routing for the Project.

However, there is no specific development or Project proximal to the project footprint that has been made public or which has been made explicit in meetings with Stakeholders and/or County Authorities.

## **7.6 DECOMMISSIONING IMPACTS**

It is anticipated that the impacts associated with decommissioning will be similar to those encountered during construction.

However, as of now, decommissioning is not planned as the project is intended to continuously supply potable water to the priority areas. Despite this, situations in future which are not envisaged at the moment such as improved technology, change in land use and changes in the water regime may require that the project be decommissioned. In that case, a comprehensive decommissioning plan will be developed prior to the decommissioning of the facility to minimise potential negative impacts and enhance positive impacts associated with decommissioning. The decommissioning plan will be cognizant of the prevailing environmental and social conditions at that time.

## **ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN**

### **8.1 INTRODUCTION**

The purpose of the Environmental and Social Management and Monitoring Plan (ESMMP) is to ensure that social and environmental impacts and risks identified during the ESIA process are effectively managed during the construction, operation and decommissioning phases of the Project. The ESMMP specifies the mitigation and management measures to which the Proponent is committed to and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMMP also shows how mitigation and management measures will be scheduled and will ensure that the Project complies with the applicable laws and regulations within Kenya, as well as the lender requirements such as the KfW Sustainability Guidelines and World Bank Environmental and Social Framework.

The key objectives of the ESMMP are to:

- Formalize and disclose the program for environmental and social management; and
- Provide a framework for the implementation of environmental and social management initiatives.

Best practice principles require that every reasonable effort is made to reduce and preferably to prevent negative impacts while enhancing the benefits. These principles have guided the ESIA process.

Overall responsibility for the ESMMP lies with the Proponent; however, a number of specific activities will be carried out by the Contractor. The Contractor's activities will therefore be supervised by the Proponent to ensure the implementation is performed as planned.

### **8.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)**

The ESMMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts with respect to:

- Pre-construction and construction activities;
- Operation; and
- Decommissioning.

*Table 8.1* summarises the ESMMP for the Project. It describes parameters that can be monitored, and suggests how monitoring should be done, how frequent, and who should be responsible for monitoring and action.

**Table 8.1 Environmental and Social Management and Monitoring Plan (ESMMP)**

Please note that most of the costs are expected to already be incorporated in either the contractor’s or Project Proponent’s budget and will thus not result in any additional costs. They have therefore not been costed again in this table.

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
<b>Construction Phase and During Operational Maintenance Activities</b>					
General	Clearly set out environmental and social requirements within the Contractor tender documentation and include EHS scoring within the selection criteria.	Project Proponent	EHS requirements included in tender documentation	Once-off	No additional cost
	The Contractor is required to prepare and implement the Contractor’s Environmental Management Plan (CEMP) and observe the conditions set out in the EIA License, as well as the relevant KfW requirements. The CEMP should include specific management and monitoring plans which should include: <ul style="list-style-type: none"> <li>• Water Management Plan;</li> <li>• Emergency Preparedness and Response Plan;</li> <li>• Health and Safety Management Plan;</li> <li>• Traffic Management Plan;</li> <li>• Grievance Management Plan (catering for both project workers and local community members); and</li> <li>• Labour Management Plan.</li> </ul>	Contractor	Documented reports on implementation of the Management Plans are required for each Plan.	Quarterly	No additional cost  (Contractor’s cost)
Impacts on Employment, Procurement and the Economy	<ul style="list-style-type: none"> <li>• Notify identified representatives of the communities and local leaders of the specific jobs and the skills required for the Project</li> <li>• Prioritise the employment of semi-skilled and unskilled labour from the local communities.</li> <li>• Prioritise the procurement of goods and services from within local towns.</li> <li>• Develop and implement a fair and transparent employment and procurement policy.</li> <li>• Advertise all tenders.</li> </ul>	Project Proponent and Contractor	<p>Requirements for local employment included in contract established with Contractor</p> <p>Employment records indicating a significant proportion of semi-skilled and unskilled worker force from the local communities</p>	<p>Preparation of guiding documents prior to construction</p> <p>Employment records checked monthly</p>	No additional costs (Expected to be incorporated in the Project Proponent/ Contractor’s Project Management Costs)

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Impacts on Water Quality	<ul style="list-style-type: none"> <li>• Schedule construction activities for the dry season.</li> <li>• Put on hold clearing activities during heavy rains or severe winds.</li> <li>• Restrict removal of vegetation and soil cover to only those areas necessary for the development.</li> <li>• Only clear vegetation from the locations where structures will be grounded.</li> <li>• Rehabilitate disturbed areas as soon as possible to prevent erosion.</li> <li>• Contain fuel, oil/lubricant and used oil storage in bunds of 110% capacity of the stored material.</li> <li>• Store fuels in above-ground storage tanks.</li> <li>• Avail spill containment and clean up kits onsite and appropriately contain and dispose of clean-up from any spill.</li> <li>• Regularly service construction vehicles and equipment off site.</li> <li>• Keep construction vehicles on designated and prepared compacted gravel roads.</li> <li>• Cover any drainage lines on site with appropriately designed culverts. Inspect such culverts monthly.</li> </ul>	Contractor	<p>Water quality tests indicating no significant deviation from the current quality results.</p> <p>Visual observations indicating that water downstream has remained colourless</p> <p>Good housekeeping at the project site</p> <p>Well drained project site</p> <p>Areas used for temporary construction activities fully restored</p>	Water quality tests conducted monthly and the rest undertaken weekly	No additional cost  (Contractor's cost)
Impacts on Local Air Quality )	<ul style="list-style-type: none"> <li>• Spray water on soil before excavation and undertake periodic road wetting.</li> <li>• Visually inspect dust pollution and appropriately intervene if dust levels are high.</li> <li>• Restrict the speed of construction vehicles to 30 km/h or less.</li> <li>• Maintain and service machines and engines off-site.</li> <li>• Refuel from authorised fuel stations</li> <li>• Put in place a grievance procedure for dust complaints.</li> <li>• Issue and ensure use of appropriate PPE such as dust masks.</li> <li>• Transport all construction materials in designated trucks which will be covered.</li> </ul>	Contractor	<p>No dust related grievances from the community members</p> <p>Very low prevalence of Respiratory Tract Infections (RTIs) among the Project workers</p> <p>No visible excessive dust emissions during construction</p> <p>No over-speeding of project vehicles</p> <p>Appropriate use of PPE</p>	Daily	No additional cost  (Contractor's cost)

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Impact of Habitat loss and degradation	<ul style="list-style-type: none"> <li>• Development of infrastructure and cultivation areas must avoid a recommended 30-60 meter buffer of riparian vegetation which include rivers Ruiru, Bathi, Gatamayu, Mukuyu and Thiririka.</li> <li>• When creating access routes, focus on the already used routes.</li> <li>• When locating soil material borrow sites, give priority to the existing sites before entry into new sites. If none is already available, select the sites away from the riparian and focus more on already modified habitats as opposed to natural habitats. Also, limit the footprint of operation at such sites.</li> <li>• Plan in advance and demarcate areas on the ground for contractor's facilities, equipment laydown, vehicle parking and/or other requirements.</li> <li>• Induction programmes for staff, contractors, visitors and other personnel must include requirements to protect the natural environment and provide an overview of the compliance measures expected of every person to avoid impacts to the environment.</li> </ul>	Contractor	<p>No construction activities within the 30-60 metre of riparian vegetation.</p> <p>Only unavoidable new access routes opened up.</p> <p>Only already existing burrow pits used unless they are not available.</p> <p>Demarcate the project footprint in advance.</p> <p>Induction programme including the requirements to protect the natural environment.</p>	Weekly	No additional cost (contractor's cost)

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Impacts from Noise and Vibration	<ul style="list-style-type: none"> <li>• Maintain construction equipment and machinery as per the manufacturer's requirements and whenever noticed to be malfunctioning.</li> <li>• Limit all the construction activities to day time hours only (07:00 am to 7:00 pm).</li> <li>• Erect bill boards at the construction sites notifying people of the construction activity and timings.</li> <li>• Impose a speed limit of 30km/h on all vehicles transporting construction equipment and materials.</li> <li>• Prepare and implement a grievance procedure for noise complaints.</li> <li>• Develop and implement a construction health and safety plan.</li> <li>• Prepare and implement a construction emergency plan.</li> <li>• Provide and ensure use of appropriate PPE including earmuffs to all the Project employees.</li> <li>• Avoid unnecessary idling of project equipment and machinery.</li> </ul>	Contractor	<p>No recorded incidents or grievances to surrounding land users</p> <p>Appropriate use of PPE</p> <p>No excessive noise emissions</p>	Daily	<p>No additional cost</p> <p>(Contractor's cost)</p>
Wastes and Effluents	<ul style="list-style-type: none"> <li>• Preparation and implementation of a Waste Management Plan (WMP).</li> <li>• Store fuels on site in temporary aboveground storage tanks.</li> <li>• Service trucks and construction vehicles off site.</li> <li>• Adhere to Kenyan laws and regulations applicable to waste management and the MSDS.</li> <li>• Provide temporary ablution facilities and ensure treatment and/or removal of sewage wastes off site.</li> </ul>	Contractor	<p>An effective WMP in place</p> <p>Water transfer Manifests</p> <p>Records of audits/visual inspection indicating no improper waste and effluent handling</p>	Weekly	<p>No additional cost</p> <p>(Contractor's cost)</p>

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Loss of Agricultural Land	<ul style="list-style-type: none"> <li>Implement a RAP prepared for the project.</li> <li>Engage with the affected land owners on a continual basis regarding the construction process; this is to ensure activities on their land are not impacted during the construction period.</li> </ul>	Project Proponent and Contractor	<p>Land lease agreements in place</p> <p>Records of continuous engagement with the host community</p> <p>All PAPs sufficiently compensated</p> <p>Livelihoods of vulnerable PAPs fully restored.</p>	<p>Lease agreement before construction phase.</p> <p>Monthly monitoring of the vulnerable PAPs</p>	<p>Estimated cost of implementing the RAP is 11,204,008 KES (excluding remuneration for the RAP implementation team and associated logistics which are expected to already be catered for in the Project Implementation Budget).</p>
Traffic Impacts	<ul style="list-style-type: none"> <li>Agree in advance with the relevant authorities (Kenya National Transport Safety Authorities, NTSA) on arrangements and routes for abnormal loads (if any).</li> <li>Develop and implement a Traffic Management Plan.</li> <li>Ensure that all Project drivers are trained in defensive driving within the previous 3 years.</li> <li>Regularly service and maintain all project vehicles.</li> <li>Impose speed limits of less than 30 km/h on project vehicles when driving within the community area.</li> <li>Inform the local communities likely to be affected by the increased traffic of the construction program.</li> <li>Put up road signs such as "Heavy Trucks Turning Ahead".</li> <li>Develop and implement a community grievance procedure.</li> </ul>	Project Proponent Contractor	<p>No major project related road accident</p> <p>Minimal minor road incidents</p> <p>Traffic Management Plan prepared and implemented</p> <p>Grievance Mechanism in place, where traffic incidents are recorded and addressed.</p> <p>No major traffic related complaint</p> <p>All traffic related complaints addressed timely</p>	Weekly	No expected costs



Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Community Health, Safety and Security	<ul style="list-style-type: none"> <li>• Maintenance of equipment to ensure it remains efficient and effective.</li> <li>• Construction works only during day time.</li> <li>• Provision of bill boards at the construction sites notifying people of the construction activity and timings.</li> <li>• Immediate rehabilitation of completed work sites.</li> <li>• Speed limits within the project site access roads and vicinity.</li> <li>• Grievance procedure for noise complaints.</li> <li>• Implementing a construction Health, Safety and Security plan that will outline all health and safety risks including for both community and the Contractor security issues and which will provide a strategy for their management.</li> <li>• Preparation of construction emergency plan.</li> <li>• Provision of adequate personal protective equipment (PPE) to workers and training on its use as required.</li> <li>• Strict use of warning signage and tapes where the trenches are open and at other active construction sites.</li> <li>• Quarterly audits by a third party contractor to ensure H&amp;S and Security issues are effectively implemented in accordance to national H&amp;S regulations and World Bank ESS 2 (Labour and Working Conditions) and 4 (Community Health and Safety).</li> </ul>	Contractor	<p>Well maintained grievance registers for the work force and local community members</p> <p>Health and safety plans in place</p> <p>Appropriate use of PPE</p> <p>No major incident associated with the project activities</p> <p>Project related minor incidents timely addressed</p>	Weekly	Expected to be incorporated in contractor's costs.

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Labour and Working Conditions including workers' health and safety	<ul style="list-style-type: none"> <li>• Develop a Human Resources Policy and adhere to it through its policies and procedures. This will include a Labour and Employment Plan and Worker Grievance Mechanism. These requirements will also be passed on to any sub-contractors.</li> <li>• Proper hiring mechanism to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation;</li> <li>• Training on worker rights in line with Kenyan legislation to ensure that positive benefits around understanding labour rights are enhanced. This process will be formalised within the Code of Conduct that will be provided by the Proponent;</li> <li>• Detailed contracts which clearly state the terms and conditions of employment and their legal rights. Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights. Contracts must be in place prior to workers leaving their home location if applicable.</li> <li>• Training on communicable diseases and STDs and community interactions in general. This training will be developed in collaboration with local health institutions.</li> <li>• Surveillance and assurance that no children or forced labour is employed.</li> <li>• Provision of all workers with appropriate Personal Protective Equipment (PPE).</li> </ul>	Contractor	<p>Employment records and other KPIs for worker rights</p> <p>A record of workers' grievances</p> <p>Induction documentations for all workers to include necessary items</p> <p>All project workers issued with contracts clearly stating the expected working conditions</p> <p>Project workers trained on communicable diseases and STDs</p>	Monthly	Expected to be incorporated in contractor's costs.

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Cultural Heritage	Develop and implement a chance find procedure in case archaeological sites/cultural heritage sites are found during the construction process. Such procedure must incorporate liaison with the National Museum of Kenya.	Contractor	Subject Matter Expert reports during construction.	Wherever the expert is called on.	Contractor's Internal Costs.
Loss of business and income	<ul style="list-style-type: none"> <li>• Compensation at full replacement cost for affected structures.</li> <li>• Liaise with existing NGOs and organise training for the PAPs who would have lost their businesses.</li> <li>• Set aside a livelihood restoration fund for use in restoring the PAPs' livelihoods in addition to full compensation.</li> <li>• Develop and implement a feasible Livelihood Restoration Plan (LRP).</li> </ul>	Developer	Business and income of the PAPs fully restored with minimal inconvenience.	Weekly	Already catered for under loss of land (estimated cost of implementing the RAP is 11,204,008 KES (excluding remuneration for the RAP implementation team and associated logistics which are expected to already be catered for in the Project Implementation Budget)).
Increased transmission of HIV/AIDS	<ul style="list-style-type: none"> <li>• Institute HIV/AIDS awareness programme for the project workers.</li> <li>• Controlled access to Contractor's workforce camps by outsiders.</li> <li>• Provision of standard quality condoms to personnel on site.</li> </ul>	Contractor	No increase in transmission of HIV/AIDS among project workers	Monthly	Approximately 500,000 KES for buying condoms.
Disruption of public utilities	<ul style="list-style-type: none"> <li>• Carry out piloting to locate services such as pipes and cables along the Pipeline Route before commencing excavation works.</li> <li>• Notify the relevant Services Providers and Agencies (KeNHA, KURA, KeRRA, NCWSC, Kenya Power, etc.) prior to commencement of the project works.</li> <li>• Use trenchless methods (tunnelling under the road surface) at road crossings of all major paved roads.</li> <li>• Restrict the length of excavation to sections that can be reinstated within the shortest period possible.</li> </ul>	Contractor	Public infrastructure avoided.  Where avoidance is not possible, only minimum disturbance caused.	Weekly	No additional cost
<b>Operation Phase</b>					

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
General	Develop and implement operation phase H&S Management Plan meeting the conditions set out in the environmental authorisation, as well as this ESIA and KfW requirements.	Project Proponent and Contractor	An appropriate EHS Plan in place	Once	No additional costs
Impacts on Employment, Procurement and the Economy	<ul style="list-style-type: none"> <li>Notify identified representatives of the County Government of the specific jobs and the skills required for the Project.</li> <li>Prioritise the employment of unskilled labour from the local communities.</li> <li>Prioritise the procurement of goods and services from within neighbourhood towns.</li> <li>Develop and implement a fair and transparent employment and procurement policy.</li> <li>Advertise all tenders.</li> </ul>	Project Proponent Maintenance Contractor	<p>Requirements for local employment included in contract established with Maintenance Contractor</p> <p>Percentage of local community members employed on the Project</p> <p>Percentage of locally purchased goods and services</p>	<p>Preparation of guiding documents prior to operation phase</p> <p>Employment and purchase records checked monthly</p>	Internal costs
Improved Accessibility to Clean and Reliable Water Supply	Community members of the greater Githurai area connected to water Ruiru – Juja Water Supply Scheme	Project Proponent and Contractor	Percentage of community members in the greater Githurai area having connected to the Ruiru – Juja Water Supply Scheme	Twice a year	Part of the construction cost
Improved Hygiene and Sanitation in the Project Areas	Improved clean water supply in the project area.	Project Proponent and Contractor	Percentage of residents of the greater Githurai area supplied with improved clean water supply	Daily	No additional cost
Reduced Cases of Water Related Diseases	Improved clean water supply in the project area.	Project Proponent and Contractor	Prevalence of water borne diseases in the greater Githurai area	Monthly	No additional cost
Reduced Water and Sanitation Burden to Women	Improved clean water supply in the project area.	Project Proponent and Contractor	Reduction in distance moved by residents of the greater Githurai area to the water taps.	Daily	No additional cost.
Increased Land Values in the Project Area	Appreciation of property and land due to improved access to potable water.	Project Proponent and Contractor	Increases in the prices of property and land within the project area.	quarterly	No additional cost
Impact on River Ruiru Surface Flow	Apply for a variation of the existing water abstraction permit to increase the permitted water abstraction from 13,000 m <sup>3</sup> /day to 28,000 m <sup>3</sup> /day.	Project Proponent	A water abstraction permitted permitting extraction of a maximum of 28,000 m <sup>3</sup> /day granted prior to the commencement of the construction phase.	Once	Permit fees for WRA.

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
	<ul style="list-style-type: none"> <li>Observe the minimal legal environmental flows that will be included in the water abstraction permit while abstracting water for the project.</li> <li>Continuously monitor the amount of water abstracted for the project as well as residue flow. Where necessary, the amount of water abstracted should be slightly reduced to ensure that the recommended minimum environmental flow (to be stated in the water abstraction permit once it has been obtained from WRA) is maintained at all times.</li> </ul>	Developer	Water abstraction undertaken in line with the conditions of the water abstraction permit.	Continuous	No additional cost  (the monitoring personnel considered to be an employee of the developer)
	In liaison with the WRA and other relevant agencies such as the Kenya Forest Services (KFS), contribute towards protecting the sub-catchment of River Ruiru. In particular, these should in protecting the remaining pockets of forest cover and bushlands in the upper zone within the protected forest zone.	Project Proponent	River Ruiru flows consistent of better than the current flow regime.	Annually	Approximately 2,000,000 KES
Impacts on Water Quality	<ul style="list-style-type: none"> <li>Activity areas used during repairs will be re-vegetated with indigenous vegetation to prevent erosion immediately after these areas are no longer required for construction.</li> <li>The Health and Safety Plan developed during construction phase will be applied during all repairs.</li> </ul>	Project Proponent and Contractor	<p>Water quality tests indicating no significant deviation from the current quality results.</p> <p>Visual observations indicating that water downstream has remained colourless Good housekeeping at the project site</p> <p>Well drained project site</p> <p>Areas used for temporary construction activities fully restored</p>	At the start of operation phase and the twice a year	Internal operation costs

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Increased waste water generation in the Project Area due to improved water supply.	<ul style="list-style-type: none"> <li>Improved sanitation to be provided in Areas without adequate sanitation systems. This includes promotion of the use of septic tanks and soak pits in areas not connected to the sewer line.</li> </ul>	Project Proponent and Kiambu County	Housing units within the Project Area having soak pits and septic tanks for management of generated waste water.	Monthly	No additional costs; all associated costs incurred by property owners.
	<ul style="list-style-type: none"> <li>NCWSC should conduct regular inspection and maintenance of the existing Sewerage Systems in the Project Area to ensure they are in good working condition. This is particularly critical in Informal Settlements and Low Income Areas where blockage of the Sewerage Systems is most likely.</li> </ul>	NCWSC	A fully functioning sewer systems in the areas where it is available.	Monthly	No additional cost; part of the operation and maintenance costs for NCWSC.
<b>Climate Change Assessment</b>					
Impacts of forecasted temperature increases	<ul style="list-style-type: none"> <li>Supplying sufficient water to meet the water needs of the local people including increased water demand related to increase in temperatures</li> </ul>	Project Proponent	Percentage of local community homes continuously supplied with water	Daily	No additional costs
Impacts of forecasted increase in precipitation	<ul style="list-style-type: none"> <li>Increased flow in River Ruiru due to increased precipitation</li> </ul>	None, natural occurrence	Minimum water flow maintained; at times, environmental flow above required minimum flow	Daily	No additional cost
Impacts of forecasted changes in the magnitude and frequency of extreme climatic events	<ul style="list-style-type: none"> <li>Complete the construction of the Karimenu 2 and Ruiru 2 Storage reservoirs, both of which are being undertaken under separate contracts</li> <li>Install accurate water metres for the consumers</li> </ul>	Separate contractors for Karimenu 2 and Ruiru 2 Storage reservoirs	Availability of water storage reserves to ensure constant water supply	Daily	No additional costs; the storage reserves already being constructed under separate contracts  Cost of water metres already considered in the project cost
	<ul style="list-style-type: none"> <li>Controlling illegal water abstraction from River Ruiru</li> </ul>	WRMA	Water supply for the project not affected by other illegal abstractions	Daily	No additional cost; regulation of water abstraction already a role of WRA

Issue	Mitigation Measure	Responsibility for Implementation	Compliance Indicator	Frequency of Monitoring	Cost
Greenhouse gas emissions from project	<ul style="list-style-type: none"> <li>• Train project workers on management of air pollution from vehicles and machinery.</li> <li>• Maintain and service construction machinery in accordance with the legal requirements and the contractor's specifications.</li> </ul>	Contractor	<p>Project workers appropriately using vehicles and machinery to minimise unnecessary emissions</p> <p>No unnecessary emissions from project vehicles and machinery attributable to poor servicing</p>	Daily	No additional costs; will be already catered for in the contractor's costs
<b>Decommissioning Phase</b>					
All impacts	Prepare a comprehensive decommissioning plan prior to the commencement of the decommissioning activities and implement it during the conduct of the decommissioning activities. In particular, the decommissioning plan should address the management of electrical equipment including recycling or reuse where possible and the provisions already identified for the construction phase. The decommissioning phase management plan will be informed by the prevailing environmental and social information at the time and advances in technology.	Project Proponent  Decommissioning Contractor	<p>A fully developed decommissioning plan</p> <p>All negative impacts associated with the conduct of decommissioning phase activities effectively managed and kept within acceptable limits.</p>	<p>Decommissioning management plan prepared prior to the commencement of decommissioning phase activities.</p> <p>Thereafter, monitoring conducted as per the recommendations of the decommissioning management plan</p>	As per the decommissioning plan

## **8.3 ROLES AND RESPONSIBILITIES**

### **8.3.1 Contractual Obligation**

In order to ensure that this ESMMP and/or derivatives thereof are enforced and implemented, these documents must be given legal standing. This shall be achieved through incorporating the ESMMP and/or derivative documents as an addendum to the contract documents for the particular project contractors and specifying under particular conditions of the contract for the tender that the requirements of this ESMMP and/or derivative documents apply and must be met. This will ensure that the obligations are clearly communicated to contractors and that submitted tenders have taken into account and budgeted for the environmental requirements specified in this ESMMP and/or its derivatives. The successful tender ultimately becomes the signed contract, thereby ensuring that the included ESMMP becomes legally binding.

### **8.3.2 Responsibilities and Duties**

#### *The Project Proponent*

The Project Proponent has overall responsibility for ensuring that the construction and development of the Project is undertaken in an environmentally sound and responsible manner, and in particular, reflects the requirements and specifications of the ESMMP and recommendations from the relevant authorities.

The responsibilities of the Project Proponent will include:

- Appoint or designate a suitably qualified Project Manager to manage the implementation of the proposed project;
- Appoint the suitably qualified and experienced Contractor;
- Establish and maintain regular and proactive communications with the designated/ appointed PM Contractor(s) and Environmental Compliance Officer (ECO); and
- Ensure that the ESMMP is reviewed and updated as necessary.

#### *Reporting Structure:*

The Project Proponent will liaise with and/or take instruction from the following:

- Government/ regulatory authorities; and
- General Public.

#### *Contractor*

The Project Proponent will appoint a Contractor(s) to implement the development. The Contractor(s) will be contractually required to undertake their activities in an environmentally responsible manner, as described in the ESMMP.

The role of the Contractor shall be to:

- Ensure that the environmental specifications of this document (including any revisions, additions or amendments) are effectively implemented.



This includes the on-site implementation of steps to mitigate environmental impacts;

- Preserve the natural environment by limiting any destructive actions on site;
- Ensure that suitable records are kept and that the appropriate documentation is available for review;
- Take into consideration the legal rights of the individual landowners, communities and Project Proponent's staff;
- Ensure quality in all work done, technical and environmental;
- Underwrite the Project Proponent's Environmental Policy at all times, and
- Ensure that all sub-contractors and other workers appointed by the Contractor are complying with and implementing the ESMMP during the duration of their specific contracts.

The responsibilities of the Contractor will be to:

- Discuss implementation of and compliance with this document with staff at routine site meetings;
- Designate, appoint and/or assign tasks to personnel who will be responsible for managing all or parts of the ESMMP. The Contractor must appoint or designate a Safety, Health, Environment and Quality Officer (SHEQO) to monitor daily implementation of the ESMMP on the Contractor's behalf as a minimum;
- Monitor environmental performance and conformance with the specifications contained in this document during site inspections;
- Report progress towards implementation of and non-conformances with this document at site meetings with the Proponent;
- Advise the Proponent of any incidents or emergencies on site, together with a record of action taken;
- Report and record all accidents and incidents resulting in injury or death;
- Resolve problems and claims arising from damage immediately to ensure a smooth flow of operations; and
- The Contractor will be required to provide for the appropriate Environmental Training and awareness as described in this ESMP in his costs and programming.

Reporting Structure:

The Contractor will report to the Proponent, as and when required.

### *Subcontractors*

The Contractor may from time to time appoint Sub-contractors. The role of the Subcontractors shall be to:

- Perform certain services and/or provide certain products on behalf of the Contractor. The Sub-contractors will be contractually required to undertake their activities in an environmentally responsible manner, as described in the ESMMP; and
- Ensure environmental awareness among employees so that they are fully aware of and understand the Environmental Specifications and the need for them.

The responsibilities of the Sub-contractor will be to:

- Be familiar with the contents of the ESMMP, and his/her roles and responsibilities as defined therein;
- Comply with the Environmental Specifications in the ESMMP and associated instructions issued by the Contractor to ensure compliance;
- Notify the Contractor verbally and in writing, immediately in the event of any accidental infringements of the Environmental Specifications and ensure appropriate remedial action is taken; and
- Notify the Contractor, verbally and in writing at least 10 working days in advance of any activity he/she has reason to believe may have significant adverse environmental impacts, so that mitigation measures may be implemented timely.

Reporting Structure:

Sub-contractors will report to and receive instructions from the Main Contractor.

#### *Environmental Control Officer (ECO)*

The Project Proponent will appoint an independent ECO to monitor and oversee implementation of the ESMMP for the proposed construction works. The ECO is independent from the Project Proponent and Contractor(s). The ECO is given authority to ensure that the ESMMP is fully implemented and that appropriate actions are undertaken to address any discrepancies and non-compliances.

The role of the ECO shall be to:

- Act as site 'custodian' for the implementation, integration and maintenance of the ESMMP in accordance with the contractual requirements;
- Ensure successful implementation of the ESMMP; and
- Ensure that the Contractor, his employees and/or Sub-contractors receive the appropriate environmental awareness training prior to commencing activities.

The responsibilities of the ECO will be to:

- Update the Proponent on the level of compliance with the ESMMP achieved by the Contractor on a regular basis for the duration of the contract;
- Advise the Proponent on the interpretation and enforcement of the Environmental Specifications (ES), including evaluation of non-compliances;
- Supply environmental information as and when required;
- Review and approve Method Statements produced by the Contractor, in conjunction with the PM;
- Demarcate particularly sensitive areas (including all No-Go areas) and to pass instructions through the PM concerning works in these areas;
- Monitor any basic physical changes to the environment as a consequence of the construction works according to an audit schedule;
- Attend regular site meetings and project steering committee meetings;
- Undertake regular monthly audits of the construction works and to generate monthly audit reports. These reports are to be forwarded to the PM who will communicate the results and conclusions with the Project Proponent;

- Communicate frequently and openly with the Contractor and the PM to ensure effective, proactive environmental management, with the overall objective of preventing or reducing negative environmental impacts and/or enhancing positive environmental impacts;
- Advise the PM on remedial actions for the protection of the environment in the event of any accidents or emergencies during construction, and to advise on appropriate clean-up activities;
- Review complaints received and make instructions as necessary; and
- Identify and make recommendations for minor amendments to the ESMMP as and when appropriate.

Reporting Structure:

The ECO will report to the PM, who in turn will report to the Project Proponent.

## **8.4 MONITORING**

### **8.4.1 Undertaking Audits**

The PM shall appoint a qualified and experienced ECO to ensure implementation of and adherence to the ESMMP.

The ECO shall conduct audits to ensure that the system for implementation of the ESMMP is operating effectively. The audit shall check that a procedure is in place to ensure that:

- The ESMMP and the Method Statements being used are the up to date versions.
- Variations to the ESMMP, Method Statements and non-compliances and corrective actions are documented.
- Emergency procedures are in place and effectively communicated to personnel.

The audit programme shall consist of the following at a minimum:

- First audit no later than 1 month after construction commences;
- Thereafter audits at monthly intervals, at a minimum;
- An audit one week prior to practical completion of the project is granted; and
- A post construction audit within 1 week after the contractor has moved off site.

### **8.4.2 Compliance with the ESMMP**

The Contractor and/or his agents are deemed not to have complied with the ESMMP and remedial action if:

- There is evidence of contravention of the ESMMP clauses within the boundaries of the site or extensions;
- Environmental damage ensues due to negligence; and
- The Contractor fails to comply with corrective or other instructions issued by the PM, within a time period specified by the PM.

## **9 CONCLUSION**

### **9.1 INTRODUCTION**

The aim of the ESIA for the Project is to provide information to inform decision-making that will contribute to sustainable development. This Report is submitted to the National Environment Management Authority (NEMA), to provide information and an independent assessment, thus enabling NEMA to make an informed decision regarding whether or not to grant an ESIA licence for the Project to proceed in accordance with the Environmental Management and Coordination Act (EMCA), 1999 and the 2015 amendments. If granted, this Report will also assist NEMA to define under what conditions the development should go ahead. In considering the development of renewable energy projects, it is inevitable that there will be some negative environmental impacts. Following a rigorous stakeholder engagement exercise, there is overwhelming support for the project.

Through the ESIA process, which included various stakeholder input, the study team has identified and assessed a number of potential impacts relating to the development. These are discussed in the Impact Assessment and Mitigation Chapter, which also made recommendations regarding key mitigation measures for the project implementation.

### **9.2 SUMMARY OF IDENTIFIED IMPACTS**

#### **9.2.1 Positive Impacts**

The proposed project aims at increasing water supply in the greater Githurai area which is a very major positive impact. Once completed, it will benefit the sub-locations of Kiuu, Mwiki, Kahawa Wendani, Kahawa Sukari, Mwihoko A and Mwihoko B. This will ensure supply of clean potable water to the residents of these areas where water demand is expected to continue increasing from the estimated 18,562 cubic metres per day in 2019 to the estimated 28,063 cubic metres per day in 2025.

In addition to this major positive impact, outlined below are the other positive impacts that will be associated with the implementation of the proposed project. These positive impacts will mainly be realised during the operational phase and these include:

- Impacts on employment, procurement and the economy;
- Improved accessibility to clean and reliable water supply;
- Improved hygiene and sanitation in the project areas;
- Reduced cases of water related diseases;
- Reduced water and sanitation burden to women; and
- Increased land values in the project area.

### **9.2.2 Negative Impacts - Construction Phase**

There are some negative impacts which will be associated with the construction phase of the proposed project. These are:

- Impacts on water quality;
- Impacts on local air quality;
- Impact of habitat loss and degradation;
- Impacts from noise and vibration;
- Impacts from wastes and effluents;
- Loss of agricultural land;
- Traffic impacts;
- Community health, safety and security;
- Labour and working conditions including workers' health and safety;
- Impacts on cultural heritage;
- Loss of business and income;
- Increased transmission of HIV/AIDS; and
- Disruption of public utilities.

### **9.2.3 Negative impacts - Operation Phase**

The operation phase will also be associated with some negative impacts. These include:

- Impact on River Ruiru surface flow;
- Impacts on water quality; and
- Increased waste water generation in the Project Area due to improved water supply.

### **9.2.4 Climate Change Related Impacts**

In the long run, the proposed project once implemented will help the local community members to adapt to two climate change impacts. These are:

- Impacts of forecasted temperature increases; and
- Impacts of forecasted increase in precipitation.

However, the proposed project is likely to be affected by the impact of forecasted changes in the magnitude and frequency of extreme climatic events associated with climate change in the long run.

Finally, the proposed project will have a net neutral impact on greenhouse gas emissions.

## **9.3 RECOMMENDATIONS**

The Consultant recommends that every effort be made by the Proponent to accommodate the mitigation measures recommended during the ESIA process to the extent that is practically possible, without compromising the economic viability of the Project. The implementation of the mitigation measures detailed

in *Chapter 6* and listed in the ESMMP (*Chapter 7*) will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the development are enhanced and mitigated to a level which is deemed adequate for the development to proceed.

In summary, based on the findings of this assessment, the study team find no reason why the Project should not be authorised, contingent on the mitigations and monitoring for potential environmental and socio-economic impacts as outlined in the ESMMP.

Kiambu County Integrated Development Plan (CIDP) (2013 – 2017).

KNBS, 2013: Exploring Kenya's inequalities; Pulling apart or pooling together.

<http://www.kiambu.go.ke/about/infrastructure-access>

ANNEX I	PROJECT LAYOUT
ANNEX II	NEMA APPROVED TOR
ANNEX III	MINUTES OF PUBLIC BARAZAS HELD
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ANNEX IX	NEMA LICENSE FOR THE FIRM OF EXPERTS



*ANNEX I: PROJECT LAYOUT*

*ANNEX II: NEMA APPROVED TOR*

***ANNEX III: MINUTES OF PUBLIC BARAZAS HELD***

*ANNEX IV: MINUTES OF THE WORKSHOPS HELD*

*ANNEX V: LISTS OF STAKEHOLDERS CONSULTED*

*ANNEX VI: SAMPLE FILLED QUESTIONNAIRES*

*ANNEX VII: RAP REPORT*

**ANNEX VIII: PHOTOGRAPHIC REPORT**



*Figure 11.1: Public participation at Kahawa Wendani Chiefs office*



*Figure 11.2: KIIs-Kahawa Wendani Women Group discussing on the issues associated with the project*





*Figure 11.3: KIIs-Kahawa Wendani Youth Group discussing on the issues associated with the project*



*Figure 11.4: Kahawa Wendani area residents filling in the public consultation forms*



*Figure 11.5: Public participation at Ruiru Chiefs office*



*Figure 11.6: KIIs-Ruiru Women Group discussing on the issues associated with the project*



*Figure 11.7: KIIs-Ruiru Men Group discussing on the issues associated with the project*



*Figure 11.8: Ruiru Area Chief addressing the members present during the meeting*



*Figure 11.9: Public baraza held at Mwihoko Chiefs camp*



*Figure 11.10: Members present during the public Baraza at Mwihoko filling in the public consultation forms*

*ANNEX IX: NEMA LICENSE FOR THE FIRM OF EXPERTS*