

## **ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT FOR**

### **THE PROPOSED CONSTRUCTION OF PRIMARY AND SECONDARY SEWERLINES (LOT 1) ZIMMERMAN, GITHUTAI 44, KAHAWA WEST, KASARANI AND MWIKI IN NAIROBI COUNTY**



This Environmental and Social Impact Assessment (ESIA) Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act of 1999 and Environmental (Impact Assessment and Audit) Regulation 2003 and World Bank Operation Safeguards Policies.

**PROPONENT:**  
**NAIROBI CITY WATER AND SEWERAGE COMPANY LIMITED,**  
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## **SUBMISSION DETAILS**

This report has been done in compliance with the Environmental Management and Coordination Act, 1999 and the Environmental Impact Assessment and Audit Regulations, 2003 and World Bank World Bank Operation Safeguards Policies. It was conducted and compiled by a team led by:

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## **Disclaimer:**

This Environmental and Social Impact Assessment Report is based on literature review, preliminary feasibility and design reports and findings from field assessment. It is strictly confidential and any materials thereof should strictly be used in accordance with agreement from the management of Nairobi City Water and Sewerage Company (NCWSC). It is however, subject to conditions in the Environmental Management and Coordination Act 1999, Environmental (Impact Assessment and Audit) Regulations, 2003 and World Bank Operation Safeguards Policies.

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## **ACRONYMS AND ABBREVIATIONS**

AWSB - Athi Water Services Board (AWSB)  
DOSH – Directorate of Safety and Health  
EA- Environmental Audit  
EHS – Environmental Health and Safety  
EIA- Environmental Impact Assessment  
EMP- Environmental Management Plan  
EMCA - Environmental Management and Coordination Act  
ESIA – Environmental and Social Impact Assessment  
KES – Kenya Shilling  
MDGs – Millennium Development Goals  
mm – Millimeters  
m - Meters  
NEMA – National Environment Management Authority  
NCC – Nairobi City County  
NCWSC – Nairobi City Water and Sewerage Company  
NEAP - National Environment Action Plan  
NPEP - National Poverty Eradication Plan  
NWSS - National Water Services Strategy  
OP – Operational Policy  
PVC - Polyvinyl chloride  
SPAs - Service Provision Agreements  
TBD – To be determined  
TOR – Terms of Reference  
WASREB - Water Services Regulatory Board  
WB – World Bank  
WHO- World Health Organisation  
WRMA - Water Resources Management Authority  
WRUA – Water Resources User Association  
WSB – Water Service Board  
WSPs – Water Services Providers



## **EXECUTIVE SUMMARY**

### **i) The Proponent**

The Proponent (Nairobi City Water and Sewerage Company Limited) was incorporated in December 2003 under the companies Act cap 486. It is a wholly owned subsidiary of Nairobi City County Government (NCCG) and has its Headquarters along Kampala Road, Industrial Area, Nairobi. The company's core business is the provision of water and sewerage services to the city of Nairobi and its environs.

The Nairobi City Water and Sewerage Company (NCWSC) in partnership with Athi Water Services Board (AWSB) recently implemented Trunk Sewers projects along the main drainage basins and river valleys in the vicinity of the project areas. The project however had a small component of lateral sewer lines and therefore only a small number of beneficiaries located along the trunk lines can connect to it. This has resulted in under-utilization of the facilities. Due to this, Nairobi City Water and Sewerage Company propose to construct primary and secondary sewers to serve these areas. The proposed development will require large capital outlay to commission and thus the proponent has to source enough funds from development partners.

### **ii) Project Description**

The project is aimed at increasing sewer connection coverage by laying primary and secondary sewerlines in some parts of Zimmerman, Githutai 44, Kahawa West, Kasarani and Mwiki which are not connected to the main trunks. The initial design recommended construction of spigot and socket concrete sewer lengths. Design details for the proposed construction of primary and secondary sewers for each package are summarized below:-

| <b>Lot 1</b> | <b>Sewer Description</b> | <b>Pipe Diameter(mm)</b> | <b>Proposed Length(m)</b> |
|--------------|--------------------------|--------------------------|---------------------------|
| a.           | Primary                  | 450                      | 835                       |
| b.           | Primary                  | 375                      | 3,489                     |
| c.           | Primary                  | 300                      | 15,658                    |
| d.           | Secondary                | 225                      | 76,993                    |

### **iii) Objectives of the Project**

Access to improved sanitation systems remains a nationwide problem in Kenya. The limited sewerage infrastructure coupled with rapid urban growth has led to direct discharge of raw sewage into the rivers. This has resulted in heavy pollution of the rivers, poor health and

reduced quality of life. They use septic tanks and pit latrines for discharging their sewage with possibilities of environmental pollution, particularly in regard to water sources (surface sources and ground aquifers). Poorly controlled waste also means daily exposure to an unpleasant environment. The buildup of fecal contamination in rivers and other waters is not just a human risk: other species are affected, threatening the ecological balance of the environment. The overall goal of the project is to improve access to sewer services to the residents inhabitants of Nairobi County through the construction of primary and secondary sewer lines in selected settlements and promote cleaner and healthy environment.

The main objective of the proposed project is to alleviate the lives of the residents through provision of reliable and sustainable basic sanitation services. When the project is implemented, it is anticipated that the project implementation will not only reduce risks of health problems, but also lead to pollution control of waters, water sources and the environment in general.

#### **iv) Project Justification**

Most of these areas are not connected to the main sewer system hence the main mode of human disposal is mainly septic tank. There are those who have constructed their toilets within the septic tanks, and when it rains, the septic tanks become full and then it overflows to the environment. Sanitation in the target areas needs improvement hence the intervention is timely as will not only reduce risks of health problems but also lead to pollution control of rivers, water sources and the environment in general.

Construction of primary and secondary sewer lines, reticulation system will reduce the high pollution levels in the Nairobi Rivers, incidences of water-borne diseases and mortality rate. Vision 2030's Social Pillar aims at improved and increased accessibility to both safe water and sanitation services beyond present levels by the year 2030. The project directly translates to achieving of Sustainable Development Goal (6) which is the new 2030 agenda and expands Millennium Development Goal (MDG) as guided by resolutions of Rio+20 conferences. The goal focuses more on investment in adequate infrastructure in Water Sanitation, Hygiene, Water Quality, Waste Water Management, Water Scarcity and protection of Water related Ecosystems. Implementation of the project will improve the health and quality of life to inhabitants of the Nairobi City and promote cleaner urban environment by providing sewerage services through efficient collection and conveyance of wastewater.

The residents are expected to have a number of benefits, these are:-

- Improved sanitation – these areas experience frequent leaking septic tanks and pit latrines and with the new sewerage toilets this will be fully solved.
- Improved living standards- waste water will be properly disposed hence improved lifestyles.
- Prevention of communicable diseases which are associated with poor sewer/waste management, with area being sewerage all the waste water will be managed hence improving the health of the residents
- Cheap waste water management as there will be no need for exhausting services which were far expensive for the landlords.
- Clean environment, which will be enhanced by the proper management of the waste water/sewer

#### **v) ESIA Justification**

In accordance with the EMCA, 1999, all new projects must undergo environmental impact assessment so as to comply with the EIA Regulation, 2003. In addition the National Policy on Water Resources as well as the Water Rules established under the Water Act, 2002 calls for environmental impact assessment on water related projects for long term sustainability and acceptability by the beneficiaries. Water related project including sewage disposal are listed in the 2nd schedule of EMCA, 1999 as among project that should undergo EIA. The proposed intervention projects are expected to have an overall positive impact to the people and the environment. However, construction phases and certain aspects of the operations are anticipated to have environmental impacts that would require to be mitigated. This document entails an Environmental and Social Management Plan describing how these potential negative impacts will be avoided or mitigated. Environmental screening, assessments, and mitigation measures that might be necessary during the project planning, construction, and operational stages for the proposed have been identified. The magnitude of the projects justifies the ESIA to provide an Environmental and Social Management Plan (ESMP) for integration into implementation process.

#### **vi) Scope of the ESIA**

This study has been carried out within the framework of the guidelines and procedures spelt out in the Environmental (Impact Assessment and Audit) Regulations 2003, Environmental Impact Assessment guidelines and Administrative procedures, and as a result of consultations with the project proponent. World Bank OP 4.01- Environmental Assessment of the World

Bank has been triggered in order to identify, avoid, and mitigate the potential negative environmental and social impacts associated with the project. World Bank OP 4.12 – Involuntary Resettlement - will also be triggered to ensure that the any involuntary resettlement or loss of livelihood caused to persons under this project are adequately compensated based on full market replacement cost of their assets and ensuring that proper channels are provided for redress of their grievances. The study covered the physical extent of the project site and its immediate environs, implementation works of the proposed development (ground preparations, laying of pipes) among other activities and installation of key utilities and other facilities required for the project to function optimally.

**vii) Objectives of the Study**

The environmental and social impact assessment is meant to achieve the following objectives:

- To identify all potential significant environmental and social impacts of the proposed project and recommend measures for mitigation.
- To assess and predict the potential impacts during site preparation, construction and operational phases of the project.
- To verify compliance with environmental regulations.
- To generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle.
- Incorporate the findings of public consultations.
- To develop an Environmental and Social Management Plan to mitigate the identified impacts so as to ensure sustainability of the proposed Project.

**viii) Study Methodology**

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 team reviewed the available background documentation as a basis for identifying the existing situation, assessments and interaction with the intended beneficiaries. The ESIA team therefore used a combination of tools to gather pertinent information for the study. These are;-

- Field visits for physical observations of the existing infrastructure, amenities, general environmental and social setting
- Scoping and use of checklist
- Observation and recording,
- Use of questionnaires

- Review of existing literature
- Documents analysis
- Key Informants Interviews
- Photography
- Barazas.

#### **ix) Terms of Reference (TORs)**

This environmental impact assessment involved;

- Field evaluation of the proposed project areas for baseline information and verification to establish current status of the proposed site and its environs
- Concise description of the national environment legislative and regulatory framework, and any other relevant information related to the project
- Identification of predictable effects of the development on the environment (including infrastructure, occupational health and safety issues) and direction and magnitude of the change.
- Evaluation and analysis of alternatives including the proposed project, project alternative, and no action alternative.
- Analysis of the compatibility of the proposed project with the surrounding land uses (as per the prevailing policy and legal framework)
- The proposition of potential mitigation measures to be undertaken throughout the project cycle.
- Development of an Environmental and Social Management plan (ESMP) with proposed mechanism for monitoring and evaluating the compliance and environmental performance
- Prepare a comprehensive ESIA report providing the project description, potential impact and their mitigation as well as environmental and social management plans

#### **x) Policy and Legislative Framework**

The study was guided by relevant policies, legislation and institutional frameworks. The proposed project is subject to Kenyan legislation framework and the World Bank Operational Safeguards (OS) Policies. Kenyan Laws and Acts of Parliament Discussed include; EMCA 1999, Water Act 2002, Public Health Act Cap.(242); Occupation Health and Safety Act 2007; Way leaves Act Cap 292; County Government Act no 17 of 2012, Physical Planning Act 1996 (286), Eviction Way-leave and Rehabilitation Bill (2014) and Vision 2030. The assessment also made reference to the world Bank Operational Safeguards (OS) Policies.

### **xi) Potential Environmental and Social Impacts**

The proposed project may impact negatively on environment, workers, neighbors, pedestrians and society at large. The impacts may be positive or negative. This report proposes mitigation measures for negative impacts and identifies the desirable social and economic benefits. The following impacts have been identified as likely to arise from the proposed project and which this report seeks to address: These impacts include the following and will need mitigation.

#### **a) Potential Positive Impacts include:**

- Reduction of health risks associated with improper disposal of faecal
- Reduction of water borne diseases resulting from possible microbial pollution of drinking water obtained from contaminated shallow wells, or through suction of contaminated water in water supply pipes through accidental negative pressures in water pipes.
- Improvement in groundwater quality through preventing infiltration of sewerage from porous cesspits.
- Improve living conditions for targeted residents, alleviating poverty conditions through work opportunities
- Achieve economic benefit by saving some healthcare expenses, improving people's productivity and improving water resources management.

#### **b) Potential Negative Impacts include**

- Increased solid waste generation during construction phase
- There may be potential but temporary disruptions of surface runoff
- Increased noise and vibration levels during construction
- Impacts on occupational safety and health of the workers during the construction phase.
- Impact on water quality during construction activities
- Soil and Water pollution from leaks and sewage overflow and leaks
- Interference with the business and properties of some residents
- Risks of sewers clogging

### **xii) Conclusion and Recommendations**

Predicted socio-economic impacts are entirely positive, principally through creation of jobs and income. There is high appreciation of the proposed project from the residents, majority who are youth and women with direct hands-on experiences with poor sanitation and

hygiene on daily basis. In order to alleviate the expected negative impacts and to make the Project environmentally sounder, an ESMMP has been prepared, and it includes: the mitigation plan; the monitoring and enforcement requirements; and the responsible persons/organizations. In areas where social or economic disruptions are inevitable, a Resettlement Action Plan shall be developed to deal with project affected people. Proper measures should be taken into account to ensure the compensation process is done properly according to the law and OP 4.12 on Involuntary Resettlement. After assessing the project impacts, the Environment and Social Impact Assessment team's view is that the negative impacts arising out of the proposed project can be managed and therefore the Proponent should be allowed to proceed with this project on condition that the proposed Environmental and Social Management Plan is implemented and Compliance with all the relevant principal laws, by-laws and regulations impacted on by the proposed project are met.

The proposed Project will require large capital outlay to commission and thus the proponent has to source enough funds from development partners.

**Estimated Cost of Project**

Preliminary Designs estimate the cost of the project as **Kshs. 4,471,005,000.**

## **1.0 BACKGROUND INFORMATION**

### **1.1 General overview**

The growth of the Nairobi City County population is estimated at 4 per cent per annum. Increased population will exert pressure on provision of adequate and reliable water and sanitation services and demand for expanded sanitation infrastructure will also increase. The limited sewerage infrastructure coupled with rapid urban growth have led to direct discharge of raw untreated sewage into the rivers. This has resulted in heavy pollution of the rivers, poor health and reduced quality of life. The unsafe sanitary conditions and the prevalence of on-site sanitation systems in urban and peri-urban areas, have the potential to negatively impact the health of the city county population. Human excreta have been implicated in the transmission of many infectious diseases including cholera, typhoid, infectious hepatitis, polio, cryptosporidiosis, and ascariasis. The National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate it in a sustainable rational and economic way. The policy focuses on streamlining provision of water for domestic use, agriculture, livestock development and industrial utilization with a view to realizing the set goals (that are also in line with the United Nations Millennium Development Goals (MDGs) as well as Kenya's Vision 2030 (improved social wellbeing of the populace, enhanced performance of the economy and promotion of national economic development and a properly conserved ecosystem).

Water Act 2002. Provides for formulation of a national water services strategy to design a programme to ensure the progressive extension of water and sanitation services to everyone in Kenya and ensure that all areas in the country are adequately served. Construction of primary and secondary sewer connections, reticulation system and increasing the volume of wastewater collected and conveyed will reduce the high pollution levels in the Nairobi Rivers, incidences of water-borne diseases, mortality rate and ultimately improve productivity of the population. The project intends to improve and extend the sewerage system in the city of Nairobi through the construction of primary and secondary sewer lines.

### **1.2 Impacts of poor sanitation**

The impacts of poor/lack of proper sanitation are adverse but perhaps the most identified is health. Environmental degradation occurs mostly due to mismanagement of waste disposal systems, both solid and grey waters, overpopulation, poor planning and other human



practices. Environmental negative impacts also lead to health impacts and health impacts cause economic problems and vice versa. Many diseases are associated with inadequate water, sanitation and hygiene.

Poor sanitation is also a serious threat to the cleanliness of the environment and the water resources used for the supply of drinking water both surface and groundwater. Groundwater aquifers are recharged from the surface and as they are slow to accumulate, contaminants are also slow to move out. It is highly possible for untreated waste water to leach into soils thus reaching water tables and also polluting soils. The constant bad odour from excreta both from badly ventilated and unclean toilets or open defecation cause air pollution and increase the risk of disease (WHO 1999).

### **1.3 Relevance of the Policy Interventions**

There are quite a number of people using pit latrine in informal settlements. This leads to lack of privacy, security, hygiene, poor structural condition and filled pits. The practical solution is the dumping of human waste in alleys and ditches using plastic bags (referred figuratively as “flying toilets”). If the project is implemented, the people living in these informal settlements will have access to basic sanitation and sewerage services. This is a basic human right and the provision of these services will reduce incidence of diseases save time, improve security, and contribute in poverty reduction. The proposed intervention project is expected to have an overall positive impact to the people and the environment. However, construction phases and certain aspects of the operations are anticipated to have environmental and social impacts that would require to be mitigated. The magnitude of the project justifies the ESIA to provide an environmental management plan (ESMP) for integration into implementation process.

### **1.4 Responsibilities**

While the Environmental experts provided the technical understanding on the baseline environmental status, potential impacts, management options and legal framework, the client was expected to provide the full details of proposed operations and activities, input materials, site operational outline, products and by-products and any waste to be generated. The output from the ESIA Experts was an ESIA project report comprising of an executive summary, study approach, baseline conditions, existing and anticipated impacts and potential mitigation measures for anticipated negative impacts and a comprehensive environmental management plan (ESMP).

## **2.0 INSTITUTIONAL POLICY AND LEGAL FRAMEWORK**

### **2.1.1 The Environment Management and coordination Act, 1999**

The Act entitles every person in Kenya to clean and healthy environment and aims to safeguard and enhance the environment. Though there are other sectoral laws on environmental conservation, this is the supreme Act. It provides guidelines on issues of environment, stipulates offences and penalties and also lists the type of projects, which must be subject to EIA process. The proposed development is among those that require EIA process.

The following subsidiary regulations should also be complied with during the implementation of the project:-

#### **1. The Environmental (Impact Assessment and Audit) Regulations, 2009 Legal Notice No. 101.**

The Environmental Impact Assessment and Audit Regulations state in Regulation 3 states 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 preparation, submission and approval of the environmental Project report.

Part 4(1) of the Regulation further states that: “no Proponent shall implement a project for which an environmental impact assessment is required under the Act or these Regulations, unless an environmental impact assessment has been concluded and approved in accordance with these Regulations.

#### **Relevance to the Project**

The Proponent has commissioned this ESIA to comply with these regulations

#### **2. 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 29th 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.

These regulations set the standards of domestic water and waste water. The regulations are meant for pollution control and prevention and provide for the protection of water sources;

#### **Relevance**

During the operation phase, the proponent shall ensure preventive maintenance is done to avoid overflows and blockages. Overflows of raw sewage may pollute underground and surface water.

### **3. Environmental Management and Co-ordination (Waste Management) Regulations**

**2006:** The Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29th September, 2006. These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. The regulations provide for mitigation of pollution and handling of hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle.

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 proposed project, during construction phases will generate wastes which will need to be disposed of as per the guidelines in the regulations. The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste transporter;

### **4. Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009:**

These regulations are aimed at minimizing the impacts of noise and vibrations from the proposed activities, and set acceptable noise thresholds for the activities in addition, working hours are limited between, 8.00 am and 5.00 pm among other guidelines in connection with noise abatement.

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. 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.

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 centimeters per second beyond any source property boundary or 30 metres from any moving source.

### **Relevance to the project**

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. This include regular inspection and maintenance of equipment and prohibition of unnecessary hooting of vehicles

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

The National Policy on Water Resources Management and Development and the Water Act 2002, 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. This policy separates policy formulation, regulation and services provision and defines clear roles for sector actors within a decentralized institutional framework and includes private sector participation and increased community development. Under the policy, 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.

### **2.2.1 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.

### **Relevance to this project**

-Shall issue guidelines for tariff considering that the project is implemented in the informal settlements. This will ensure users are able to pay hence sustainability of the project

-Shall review and approve tariff changes if need be

### **2.2.3 Water Services Providers**

Water Service Providers are the utilities or water companies. Nairobi water and Sewerage Company being the implementer of the project shall;-

- Ensure effective communication of all matters related to project to the target group.
- Sensitize the community for buy in of the project and ensure its sustainability.
- Ensure implementation of the project in accordance with the project rules

### **2.3 NEMA Compliance**

The government established the National Environmental Management Authority (NEMA) as the supreme regulatory and advisory bodies on environmental management in Kenya under EMCA 1999. NEMA is charged with the responsibility of coordinating and supervising the various environmental management activities being undertaken by other statutory organs. NEMA also ensures that environmental management is integrated into development policies, programs, plans and projects.

### **2.4 Administrative Framework**

#### **2.4.1 Way-leaves Act (Cap 292)**

Under Section 3 of this Act, the Government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever but may not in so doing interfere with any existing building.

#### **2.4.2 Land Act, 2012**

The Land Act 29(“LA”) is the Kenya’s framework legislation regulating compulsory acquisition of land (i.e. land, houses, easements etc.). The LA was adopted on 2nd May 2012 and provides for sustainable administration and management of land and land based resources including compulsory acquisition. The land Acquisition Process is well spelt out in the Act. Section 107, that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110 of Land Act 2012, the possession of the land must be necessary for public purpose or public interest, such as, in the interests of public defence, public safety, public order, public morality, public health, urban and planning, or the development or utilization of any property in such manner as to promote the public benefit.

Part III of the Land Act 2012, section 113 (2a) states that “the Commission shall determine the value of land with conclusive evidence of (i) the size of land to be acquired;

(ii) the value, in the opinion of the Commission, of the land; (iii) the amount of compensation payable, whether the owners of land have or have not appeared at the inquiry.” This can be interpreted that NLC must determine the value of the land accordingly and pay appropriate just compensation in accordance with the principles and formulae that it will develop.

### **Relevance to the Project**

The proponent shall utilize the existing sewer wayleaves. The Act together with reference to the World Bank Safety guard OP 4.12 Involuntary Resettlement shall be used as reference during preparation and implementation of Project in case private assets and sources of livelihood are impacted.

## **2.5 National Environmental Acts**

The EIA guidelines available for Kenya, especially the EMCA 1999 and NEMA Environmental Impact and Audit Regulations 2003, were closely followed in this ESIA. Awareness regarding the relationship between the environment and economic development in Kenya continues to grow since 1992 when Kenya joined the rest of the world in endorsing Agenda 21 as the global blueprint for sustainable development. To this end Kenya has recognised the need for mainstreaming environmental issues in all aspects of its economic development. This will ensure that the project is environmentally sustainable and will result in minimal environmental hazards.

### **2.5.1 Water Act 2002**

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

### **Relevance to the Project**

This Act shall be relevant during both construction operation phases of the Project whereby the contractor and proponent shall ensure that all relevant water resources are not polluted from both liquid and solid wastes. AWSB shall also obtain authorization by WRMA before discharging treated sewer into the river channels.

### **2.5.2 Public Health Act Cap 242**

The Act protects human health. It prevents and guards against introduction of infectious diseases into Kenya from outside, promotes public health as well as the prevention, limitation or of infectious, communicable or preventable diseases within Kenya. Its objective is also to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health.

This act provides for securing and maintaining health. This Act defines what an environmental nuisance is and this includes emissions of wastes, gases, smoke and the general pollution of land, air and water. During the construction of the bridge, it is likely that wastes and accidents may occur. Section 118 (c) deems it a nuisance for any street , road, or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water tank etc. so foul or in such a state or so situated or constructed as in the opinion of the medical officer of health to be offensive or to be injurious or dangerous to human health. Street here includes bridges, footway, square, court, alley etc.

#### **Relevance to the Project**

The Act provides guideline to the contractor on how he shall manage all wastes (Liquid and Solid Wastes) emanating from the Project in a way not to cause nuisance to the community, this Act during construction shall be read alongside the waste management regulations of EMCA 1999 for utmost compliance. The Act also shall be applied to ensure that the food that is provided to the workers during construction of the Project meets the safety requirements.

### **2.5.3 County Government Act No. 17 of 2012**

Part II of the Act empowers the county government to be in charge of function described in Article 186 of the constitution, (county roads, water and Sanitation, Health), Part XI of the Act vest the responsibility of planning and development facilitation to the county government with collaboration with national government, this arrangement has been adopted for interventions in order not to conflict with provisions of the Kenyan Constitution.

#### **Relevance to the Project**

The contractor shall be hand over the project once complete to Nairobi Water and Sewerage Company which is a subsidially of Nairobi County Government.

#### **2.5.4 Eviction Way leave and Rehabilitation Bill (2014)**

The Bill main objective is to set out appropriate procedures applicable to evictions and resettlement, the bill also has outlined principles that are intended to guide the resettlement and eviction procedures including:

- Every person shall be protected from arbitrary eviction;
- the persons, affected by an eviction should not suffer detriment to their human rights;
- the State while carrying out eviction and resettlement, must observe the human dignity, equity, social justice, human rights, non-discrimination and protection of the marginalized and vulnerable groups; and
- every person has the right to administrative action that is expeditious, efficient, reasonable and procedurally fair.

Part (111) section (17) of the bill elaborates of the process to be undertaken when the government intends to evict persons from their land to create room for project, the bill gives power to the cabinet secretary based on the Environmental and Social Impact Assessment Report prepared, prepare a plan for the resettlement of the affected persons after consultation with the representatives of the affected persons.

#### **Relevance to the Project**

The proponent shall utilize the existing sewer wayleaves. The Act together with reference to the World Bank Safety guard OP 4.12 Involuntary Resettlement shall be used as reference during preparation and implementation of Project in case private assets and sources of livelihood are impacted.

#### **2.5.5 Occupational Safety and Health Act, 2007**

The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provisions require that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the workplace. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site. The Act provides for all necessary safety precautions to ensure the health and safety of workers. The proponent and contractor undertake to prevent pollution, minimize the emission of dust and production of noise during the process of site preparation and development. The proponent should also undertake to provide all workers with appropriate PPEs so as to ensure health, safety and



welfare for the workers that will be employed onsite.

### **Relevance to the Project**

The Act provides Occupational Health and Safety guidelines which shall be followed by both the contractor and supervising consultant during implementation of the Project in order to avoid injuries and even loss of life to workers and the community.

### **2.5.6 Physical Planning Act 1996 (286)**

Section 29 of the Act empowers the local Authorities (now county governments) to reserve and maintain all land planned for open spaces, parks, urban forests and green belts as well as land assigned for public social amenities. The same section allows for prohibition or control of the use and development of an area. Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority.

### **Relevance to the Project**

The act regulates and harmonizes development and use of land over the Country, the entire pipeline route has been designed within the way leave. The proponent is advised to design the sewer lines on existing wayleaves to avoid cases of acquisition of private property and resettlement complications.

## **2.6: AFDB ENVIRONMENTAL AND SOCIAL OPERATIONAL SAFEGUARDS**

The Bank's commitment to improving environmental and social sustainability in its investments is reflected in the several related policies and tools it has adopted and the changes in its institutional set-up to ensure effective implementation of these policies and tools.

### **2.6. 1: OS 1: Environmental and Social Assessment**

This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements: the scope of application; categorisation; use of a SESA and ESIA, where appropriate; Environmental and Social Management Plans; climate change vulnerability assessment; public consultation; community impacts; appraisal and treatment of vulnerable groups; and

grievance procedures. It updates and consolidates the policy commitments set out in the Bank's policy on the environment.

### **2.6.2: OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation**

This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement, and it incorporates refinements designed to improve the operational effectiveness of those requirements. In particular, it embraces comprehensive and forward-looking notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasizes the need to maintain social cohesion, community structures, and the social interlinkages that common property provides. The safeguard retains the requirement to provide compensation at full replacement cost; reiterates the importance of a resettlement that improves standards of living, income-earning capacity, and overall means of livelihood; and emphasizes the need to ensure that social considerations, such as gender, age, and stakes in the project outcome, do not disenfranchise particular project-affected people.

### **2.6.3: OS 3: Biodiversity and Ecosystem Services**

The overarching objective of this safeguard is to conserve biological diversity and promote the sustainable use of natural resources. It translates into OS requirements the Bank's commitments in its policy on integrated water resources management and the UN Convention on Biological Diversity. The safeguard reflects the importance of biodiversity on the African continent and the value of key ecosystems to the population, emphasising the need to "respect, conserve and maintain [the] knowledge, innovations and practices of indigenous and local communities... [and] to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirement.

### **2.6.4: OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency**

This safeguard covers the range of impacts of pollution, waste, and hazardous materials for which there are agreed international conventions and comprehensive industry-specific standards that other multilateral development banks follow. It also introduces vulnerability analysis and monitoring of greenhouses

### **2.6.5: OS 5: Labour Conditions, Health and Safety**

This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It covers working conditions, workers' organisations, occupational health and safety, and avoidance of child or forced labour

#### **Relevance**

The Project is being financed by AfDB, was therefore checked against the above listed operation safeguards likely to be triggered under each policy was summarized in **table 2.1** below

**Table 2.1: AfDB Operational Safeguards Triggered**

| <b>POLICY</b>  | <b>Criteria</b> | <b>Discussions</b>  |
|--|-----------------|---|
| OS 1: Environmental and Social Assessment.   | Yes             | The Project components will trigger EA safeguards and is Category B due to the interaction with the physical, biological and social setting within the immediate surroundings   |
| OS 2: Involuntary Resettlement, Land Acquisition, Population Displacement and Compensation.            | Yes             | The Project shall be constructed within existing sewer way leaves, and road reserves, however, cases of encroachment to existing wayleaves and road reserves were observed which implies that RAP has to be prepared as a separate report.  |
| OS 3: Biodiversity and Ecosystem Services.   | No              | Project activities have no direct linkage to biological diversity and ecosystem services<br>OS 1 shall be applied in isolated minor cases of biodiversity and ecosystem services.   |
| OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency. | Yes             | The Projects shall utilize raw materials both during construction and operation phase that could result to pollution of biophysical environment if not handled appropriately. Project activities shall not result to significant amount of greenhouse gases,<br>The Project design has ensured that the sewer flows through the sewerage infrastructure by gravity hence reducing the need for pumping. |
| OS 5: Labour Conditions, Health and Safety.  |                 | The Project shall involve workers both during construction and operation phases of the project. this policy read together with OSHA 2007 shall form integral instruments to be used in ensuring health, safety and working conditions of both works and community   |

### **3.0 STUDY METHODOLOGY**

#### **3.1 Introduction**

The study methodology involved scoping and use of checklist, field survey techniques, observation and recording, use of questionnaires, Discussions with key informants, barazas and review of existing literature. This was done in line with the requirements of Environmental Management and Coordination Act (EMCA) 1999 and Environmental (Impact Assessment and Audit) Regulations 2003 and World Bank OP Safeguards among other legal and regulatory frameworks. Reference was also made to EIA reports dealing with similar projects from other parts of the country.

#### **3.2 Scoping and use of Checklists**

In analyzing of the impacts of the proposed project, a scoping checklist was used to isolate the broad areas on which the project would potentially have impacts on the environment. This helped in identifying and predicting on the possible impacts that are expected from the proposed development. The process helped to narrow down onto the most critical issues requiring attention during the Assessment

#### **3.3 Observation and recording**

Some data were generated through observation and recording at site. The current land use systems, topography, geology and natural drainage system, communication system and infrastructure were observed during the site visits while verbal inquiries from the residents helped in providing the recent changes that have occurred in the area in terms of land use.

#### **3.4 Physical assessment of the proposed site and surrounding areas**

Field visits were carried out by the experts for the physical inspections of the project status and characteristics of the site and its surrounding environment. This was to enable accurate prediction of environmental impacts associated with the proposed project. Field visits were meant for physical inspections of the site characteristics and the environmental status of the proposed site area and its surroundings. This was to enable accurate prediction of environmental impacts of the proposed project to the environment.

#### **3.5 Photography**

Photos were taken to show the actual site of the proposed development, resources on site and neighboring developments.

#### **3.6 Public Participation**

Discussions with stakeholders were held, consultation with key informants, interviewed the

residents and holding of Barazas. Interviews were conducted through a semi-structured questionnaire (attached in the appendix of this report). Several consultations were conducted with key Informant relevant to the project. These informants included County Government, Local Administration ie ward administrators, Chiefs and Assistant Chiefs, Members of the County Assembly and management of Nairobi Water and Sewerage Company Ltd. This offered useful information on:-

- any issues, objection, interest and concerns that they might have on the proposed project
- Alternatives or option if any which can cater for their objection, interest or concern.

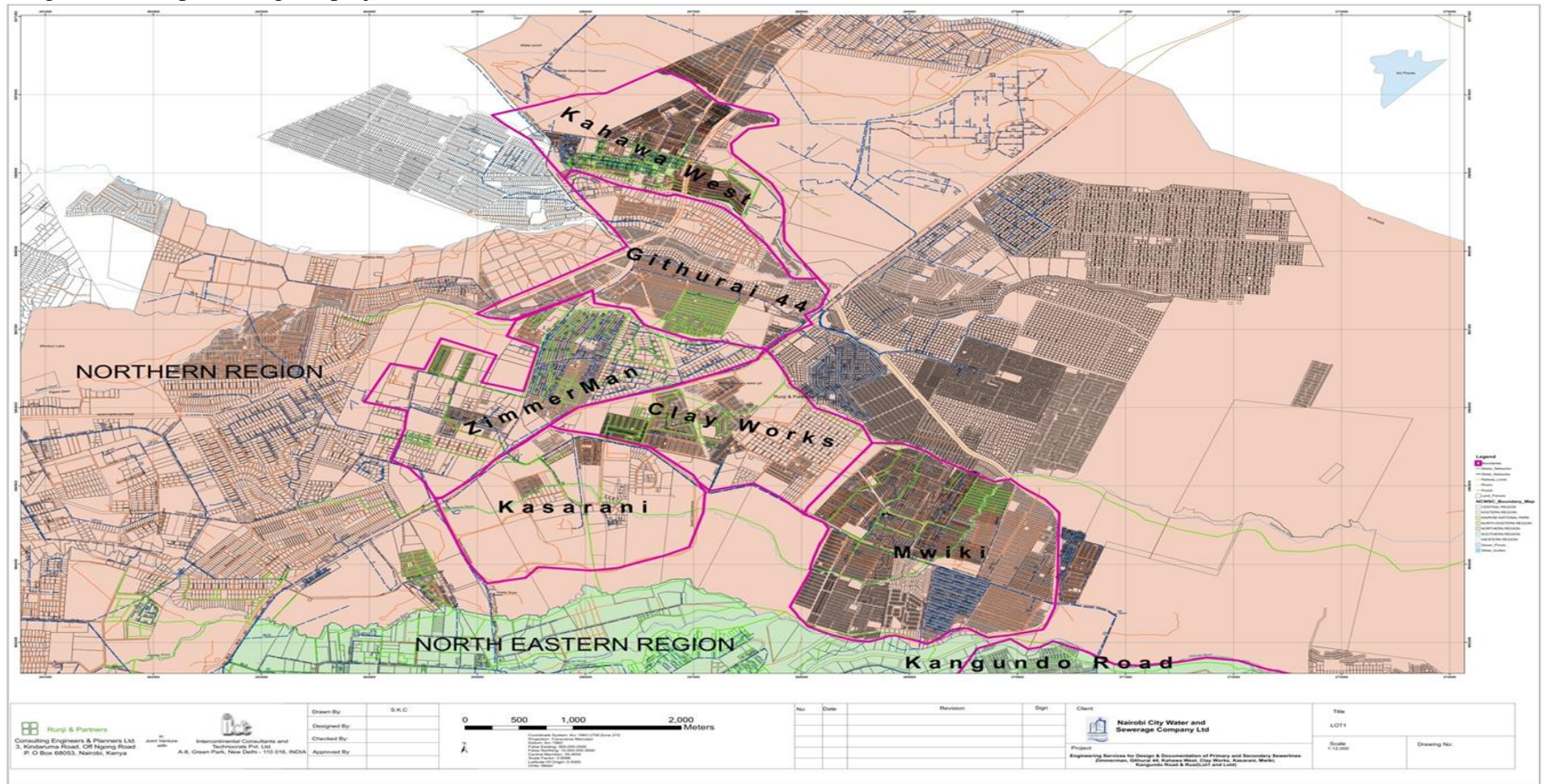
### **3.7 Desk Reviews**

The following documents were consulted for the respective purposes:

- Preliminary Designs of the proposed Project
- The Environmental Impact Assessment and Audit regulations were consulted to help in organizing on how to conduct the study and appropriate layout of the report to be compliant with the regulations
- The Environmental Impact Assessment (EIA) (Guidelines and Administrative Procedures) issued by NEMA
- World Bank Safe guard Policies were also consulted.

## 4.0 PROJECT LOCATION, SCOPE, AND ACTIVITIES

Figure 4-1: Map showing the project sites



#### **4.1 Coordinates of the project areas**

The areas falls between **265433.8** and **268220.5** Eastings and **9865758.5** and **9867407.3** Northings. The average altitude is between 1800 and 1830 meters above sea level (masl).

##### **a) Zimmerman**

The Zimmerman area of focus is on both sides of Kamiti Road from Kamiti Road – Thika road junction to Gatharaini River. The area can easily be divided into two with left hand side of Kamiti road being Roysambu and right hand side called Zimmerman as per administrative boundaries. Access is through Thika Road, Kamiti road or Northern Bypass.

##### **b) Githurai 44**

The area of focus is along Kamiti road between Gatharaini River and Kiu river. The area is predominantly residential with some commercial premises along the main roads. Githurai 44 is accessed through Thika road, Kamiti road and Eastern Bypass.

##### **c) Kahawa West**

The area of focus is between Kiu river and Gok Kamiti Maximum Prison, extending from Kamiti road to the railway line. Kahawa West is a peri-urban area. Kahawa West sewerage treatment pond is also in this area. The area is accessed through Kamiti road, Eastern By-pass and a railway line.

##### **d) Clay Works**

Clay works is the area between Thika road, Kasarani Mwiki Road, Gatharaini River and Maji Mazuri River. It covers the whole of Clay City Sub location of Kasarani Location. There are both low and high rise buildings. The area is accessed by Thika road and Kasarani Mwiki road.

##### **e) Kasarani**

Kasarani is the area on the right hand side of Kasarani Mwiki road from Thika road to the Maji Mazuri river Crossing. The area houses the Kasarani Sub-County's offices and the Kasarani Sports Centre. The area is accessed by Thika road and Kasarani Mwiki road.

##### **f) Mwiki**

Mwiki is the area on both sides of Kasarani Mwiki road from Maji Mazuri River to the railway line. The area is accessed by Kasarani – Mwiki Njiru road and a railway line.



## 4.2: Project Scope

The project is aimed at increasing sewer connection coverage by laying primary and secondary sewer lines in some parts of Zimmerman, Githutai 44, Kahawa West, Kasarani and Mwiki which are not connected to the main trunks. The initial design recommended construction of spigot and socket concrete sewer lengths. Design details for the proposed construction of primary and secondary sewers for each package are summarized below:-

| Lot 1 | Sewer Description | Pipe Diameter(mm) | Proposed Length(m) |
|-------|-------------------|-------------------|--------------------|
| a.    | Primary           | 450               | 835                |
| b.    | Primary           | 375               | 3,489              |
| c.    | Primary           | 300               | 15,658             |
| d.    | Secondary         | 225               | 76,993             |

The works includes site clearance, excavation, and construction of sewers of various diameters and depths including the associated manholes. The works will incorporate environmental guidelines, health and safety measures.

## 4.3. Materials and Inputs

The materials shall include the following;

### i) Raw Material

Most of the construction materials that will be used shall be locally sourced, such as Construction raw materials i.e. sand, cement, stones, crushed rock (gravel/ballast) among others.; other. All this should be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.

### ii) Pipes

It is intended to use the following types of pipes:

#### a) Concrete Pipes

Pipes are vertically cast in vibrated moulds and supplied with rubber rings. Rigid jointed pipes require jointing with tarred Hessian and cement mortar. These pipes are laid on concrete bed and provided with a concrete haunch and surround or reinforced to meet the particular loading requirements.

#### b) uPVC Pipes

Due to the resistance of uPVC pipes to acids and sulphates, this material will be compared against the concrete pipes and if found to be more economical then it will be adopted for this project. The pipes are found to be suitable in areas such as where embankments are likely to

settle, or where very steep gradients result in high velocity and possible pipe erosion, or where water logged areas have to be traversed and concrete pipes become unsuitable because of their porosity.

#### **c) Steel Pipes**

These will be used for locations where sewers are exposed, since they are protected internally and externally with bitumen sheathing or concrete lining. Joints are either bolted flanges or Viking Johnson couplings.

#### **d) Manholes**

Precast concrete manhole rings, which are manufactured locally, will be used for construction of manholes or in-situ construction of manholes. Precast manhole rings will be surrounded with a minimum thickness of 150 mm concrete to improve water tightness and stability. For access purposes, cast iron step irons will be built into the manhole rings. The nominal vertical interval between all the step irons within a given manhole is 300 mm and will be staggered.

#### **iii) Water**

The water to be used both during operation of the project will be obtained from Nairobi Water and Sewerage Company (proponent)

#### **vi) Labor**

A wide range of both skilled and unskilled labor will be required for implementation of the project. It is expected that the majority of this labor will be sourced from the locals

#### **v) Equipments**

Equipments used in the project implementation are:-

- water bowsers
- Construction machines including machinery such as excavators, compressors trucks, concrete mixers, tools and other relevant construction equipment
- pick-ups and trucks

### **4.4 Construction activities**

The main activities during the project implementation will include but not limited to the following:

- Procurement of construction materials from approved dealers
- Transportation of construction materials and debris using heavy and light machinery
- Appropriate storage of construction materials.

- Preparation of the grounds-this will involve excavation works to create space for laying of sewer pipes
- Plumbing works: Includes installation of sewer pipes, connection to existing sewer
- Covering of the laid sewer lines and landscaping
- excavation, earth works and filling, masonry works
- Disposal of the resulting debris/waste materials. All debris and excavated materials will be dumped on approved sites but should be recycled in then project as much as possible e.g. in backfilling
- Completion of the development and operation

#### **4.5 Activities during Operation Phase**

The sewers have been designed to be self-cleansing and should therefore require only routine maintenance once the system is fully operational. However, during the early stages of operation of the system the flow in some lengths will be very low and a certain amount of settlement of solids may take place, and some flushing may be required. Periodic inspections should therefore be carried out to prevent blockages which may be difficult to remove if allowed to build up. Manhole covers are specifically designed to be tight fitting to prevent ingress of sand and surface water but some sand may enter the foul sewer system from other sources such as house connections and hence settlement may take place at low flows. A regular routine inspection of sewer and manhole should be carried out in order to ensure that blockages are cleared as they occur and continuous flows are maintained.

When a cover has been removed all dirt should be cleaned from the seating and a thin film of grease should be applied to the edges of the cover before it is replaced.

It is also most important to prevent oil and garage water from entering the sewage system. The presence of garage wastes in the in the sewers is particularly dangerous as there is a great risk of explosion of the gases from these wastes. If oil is noticed in the discharge to the treatment works or at any manhole, the source of the oil should immediately be investigated and its entry into the sewerage system prevented

##### **4.5.1 Flushing**

Generally used for dislodging and transporting sludge mud, sand and gravel. This should be used on a regular basis in sewers where a self-cleansing flow is rarely achieved. This situation often occurs at the head of newly constructed sewers when only a few properties have been

connected. Is required to transport the flush water to the manhole, and have a sufficiently large outlet to allow the required discharge rate.

#### **4.5.2 Rodding and boring**

This involves dislodging and transporting sludge, mud, grease and encrustations using correct tools and adequate flushing water. Flexible screwed rods with a variety of heads are inserted into the sewer which when worked back and forth and rotated by hand, break up obstructions. The dislodged materials are transported to the downstream manhole by the sewage flow, or with flushing water if required. For heavier cleaning and in large diameter sewers, machines can be used which rotate the cutting head or other tools at the end of a flexible rod.

#### **4.5.3 Removal of Dislodged Material from Sewers**

All solid material removed from the sewer should be disposed of a designated dumping site

The proponent (NCWSC) shall;-

- Maintain sewers and ensuring manholes are covered at all times to eradicate potential overflow of sewage from the immediate manholes into open drains
- Creating appropriate sense of responsibility to all the users on keeping sewer line free of garbage and functional at times.
- Engaging community groups and leaders in resolving emerging issues. This shall be done by having focus group discussions.

#### **4.6 Activities during Decommissioning Phase**

Decommissioning is an important phase in the project cycle and comes as the last to wind up the operations/activities of a particular project. Decommissioning of a facility and property includes: the removal of hazardous materials and wastes, cleaning and removal of equipment, decontamination, rehabilitation and remediation and the termination of the operational permits and licenses.

The main purpose of decommissioning is to restore/ rehabilitate the site to acceptable standards. It shall be done in line with the principles of sound environmental management, it is paramount to develop a plan as a way of simplifying decommissioning in future.

## **5.0 PROJECT AREA AND ENVIRONMENTAL SETTING**

### **5.1 Bio-physical**

The Nairobi city is located within the Athi River Catchment and is traversed by three key rivers namely Nairobi, Mathare and Ngong. All the existing trunk sewers run along the riparian reserve of these rivers. Currently, the rivers experience pollution from both domestic and industrial point sources and from agriculture non-point sources. Nairobi's main drainage follows the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains, comprising mainly the Athi plains and the northern section of the Kapiti plain, extend westwards, rising from 1493m at the Athi River to 1829m in the faulted region near Ngong.

### **5.2 Geology/Soils**

The soils in Nairobi are products of mainly weathering and erosion of underlying volcanic rocks under relatively high temperatures, rainfall and poor drainage. As a result of impeded drainage of the plains, the soils are black to dark grey clays (Grumosolic) comprising black cotton soils with calcareous and non calcareous variants. The crystalline rocks are rarely exposed but occasionally fragments and found as agglomerates derived from the former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 15m in thickness.

### **5.3 Solid Waste Disposal**

The solid wastes of the areas include household wastes, commercial refuses, institutional refuses, and street sweepings. Waste disposal and collection is managed by both the County government and private collectors.

### **5.4 Land Requirement / Ownership**

Efforts shall be undertaken to minimize project impacts to people's property and businesses, assets and sources of livelihood. Where the proponent will interfere with property in order to acquire sewer wayleave, a compensation action plan shall be prepared as a separate report based on AFBD guidelines, Kenyan law and procedures and precedents established in Kenya. The procedure should incorporate objective assessment compensation, investigation and analysis to determine the nature of each particular case.

## **5.5 Fauna**

There are no terrestrial or aquatic habitats in the Project areas since the areas are generally occupied by middle class people and characterized by apartments and maisonettes. There are also medium and large businesses, super markets, petrol stations, financial institutions.

## **5.6 Sanitation Situation**

The sanitation situation is generally poor with most residence using septic tanks. The septic tanks are either exhausted when full and discharged into the trunk sewer lines. There are illegally connections into the existing sewer lines. The Nairobi City Water and Sewerage Company (NCW&SC) in partnership with Athi Water Services Board (AWSB) recently implemented Trunk Sewers projects along the main drainage basins and river valleys in the vicinity of the project areas.

### **a) Roysambu**

Roysambu is located along Kamiti road Off Thika Super Highway. It is usually occupied by middle class people. The area is characterized by apartments and maisonettes. The sanitation situation in the settlement is moderate. Residents usually use septic tanks. The area is also served with sewers. However, there are some sewer lines that keep on blocking and sewer overflows into the open drains along the road. This exposes residents and road users to the danger of getting water borne diseases and foul smell.

### **b) Zimmerman**

Zimmerman is located along Kamiti road, off Thika Super Highway. It is usually occupied by middle class people. The area is characterized by apartments. The sanitation situation in the settlement is moderate. Residents usually use septic tanks. Though there is a recently constructed trunk sewer line and a few laterals, sewer flows into the open drains along the road. This exposes residents and road users to the danger of getting water borne diseases and foul smell.

**c) Githurai 44** is located along Kamiti road and also cut across by Northern bypass. It is usually occupied by both middle and low class people. The area is characterized by apartments. The sanitation situation in the settlement is moderate. Residents usually use septic tanks though there is a recently constructed trunk sewer line and a few laterals.

### **d) Kahawa West**

Kahawa West is located along Kamiti road and cut across by Northern Bypass. The area is generally occupied by both middle and lower class people. It is characterised by apartments

and the old Nairobi City council buildings. Some areas are well planned and almost fully serviced. The sanitation situation in the settlement is moderate. Residents usually use both septic tanks and sewer lines. However, the pond that the sewer lines drain to is overloaded and does not effectively treat sewage

**e) Clay Works**

Clay Works is located between Thika Super highway, Kasarani Mwiki road and Gathara-in River. It is an area generally occupied by middle class people. It is characterized by apartments and maisonettes. The sanitation situation in the settlement is moderate. Residents usually use both septic tanks and sewer lines. There is a recently constructed Trunk sewer line.

**f) Kasarani**

Kasarani is located between Thika Super highway and Kasarani Mwiki road. This is where Kasarani sports centre is located. Kasarani Sub-County offices are also in this area. It is an area generally occupied by middle class people. It is characterized by apartments and maisonettes. The sanitation situation in the settlement is moderate. Residents usually use both septic tanks and sewer lines. There is a recently constructed Trunk sewer line.

**g) Mwiki**

Mwiki is located along Kasarani Mwiki road. It is an area generally occupied by both low and middle class people. It is characterized by apartments and simple houses. The sanitation situation in the settlement is poor. Residents usually use both septic tanks and sewer lines. There is a recently constructed recently constructed trunk sewerline passing through this area.

## **5.7 Access to Human Waste Disposal Services**

The main mode of human waste disposal in the target areas is pit latrines and septic tanks. According to the landlords, septic tanks are a necessary evil and expensive means of human waste disposal. Currently the landlords spend approximately 50,000 to build septic tanks and a further Kshs 4,000 per year to empty the septic tanks when full. This has financial implication. During rainy seasons the septic tanks get full fast and even flood into the tenant's houses. To avoid the septic tanks getting full fast, the landlords direct the sewage from bathrooms and kitchens elsewhere, mostly to the roads and foot paths.

## **5.8 Water Supply and Demand**

The areas are served by NCW&SC and partly by privately operated boreholes within these areas.

**Table 5-1 Summary of water demand in the Project Areas**

| <b>Demand Area</b> | <b>Total Net Demand (l/d) 2016</b> | <b>Total Gross Demand (l/d) 2016</b> |
|--------------------|------------------------------------|--------------------------------------|
| Zimmerman          | 10,708,361                         | 12,850,033                           |
| Githurai 44        | 12,710,217                         | 15,252,260                           |
| Kahawa West        | 11,967,018                         | 14,360,421                           |
| Clay Works         | 15,343,085                         | 18,411,702                           |
| Kasarani           | 2,492,689                          | 2,991,227                            |
| Mwiki              | 10,275,928                         | 12,331,114                           |
| <b>Totals</b>      | <b>63,497,298</b>                  | <b>76,196,758</b>                    |

## 5.9 Climate

The areas have a fairly cool climate resulting from its high altitude. It has a bi-modal rainfall pattern. At 1,795metres (5,889ft) above sea level, Nairobi enjoys a moderate climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). The sunniest and warmest parts of the year are from December to March, when temperatures average the mid-twenties during the day.

**Table 5-2: Weather averages for Nairobi**

| <b>Month</b>                          | <b>Jan</b>     | <b>Feb</b>     | <b>Mar</b>     |  | <b>Apr</b>      | <b>May</b>      | <b>Jun</b>     | <b>Jul</b>     | <b>Aug</b>     | <b>Sep</b>     | <b>Oct</b>     | <b>Nov</b>      | <b>Dec</b>      |
|---------------------------------------|----------------|----------------|----------------|--|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|
| <b>Average high °C (°F)</b>           | 24.5<br>(76)   | 25.6<br>(78)   | 25.6<br>(78)   |  | 24.1<br>(75)    | 22.6<br>(73)    | 21.5<br>(71)   | 20.6<br>(69)   | 21.4<br>(71)   | 23.7<br>(75)   | 24.7<br>(76)   | 23.1<br>(74)    | 23.4<br>(74)    |
| <b>Average low °C (°F)</b>            | 11.5<br>(53)   | 11.6<br>(53)   | 13.1<br>(56)   |  | 14.0<br>(57)    | 13.2<br>(56)    | 11.0<br>(52)   | 10.1<br>(50)   | 10.2<br>(50)   | 10.5<br>(51)   | 12.5<br>(55)   | 13.1<br>(56)    | 12.6<br>(55)    |
| <b>Precipitation mm (inches)</b>      | 64.1<br>(2.52) | 56.5<br>(2.22) | 92.8<br>(3.65) |  | 219.4<br>(8.64) | 176.6<br>(6.95) | 35.0<br>(1.38) | 17.5<br>(0.69) | 23.5<br>(0.93) | 28.3<br>(1.11) | 55.3<br>(2.18) | 154.2<br>(6.07) | 101.0<br>(3.98) |
| <i>Source: WorldWeather.org, 2008</i> |                |                |                |  |                 |                 |                |                |                |                |                |                 |                 |

The mean maximum temperature for this period is 24 °C (75 °F). There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. As Nairobi is situated close to the equator, the differences between the seasons are minimal. The seasons are referred to as the wet season and dry season. The timing of sunrise and sunset varies little throughout the year, due to Nairobi's close proximity to the equator.

## 5.9 Population Growth

Rural-Urban migration is a critical factor as far as population growth in the County is concerned. The County forms part of the country's capital city and receives a high percentage



of job seekers from other parts of the country. A huge percentage of this population ends up in the informal settlements within the County. This has resulted in mushrooming of several informal settlements. The high population has overstretched facilities like water and sewerage. The challenges in the current human settlement patterns include; environmental pollution mainly from solid and liquid waste. The population increase is not commensurate with increase in resources and puts pressure on the existing social resources. There is need to improve sanitation in order to reduce chances of contracting diseases.

**Table 5-3: Population Projection**

|               | <b>POPULATION PROJECTIONS</b> |                           |                             |
|---------------|-------------------------------|---------------------------|-----------------------------|
| <b>AREA</b>   | <b>Initial Year (2016)</b>    | <b>Future Year (2026)</b> | <b>Ultimate Year (2036)</b> |
| ZIMMERMAN     | 58,561                        | 82,606                    | 111,015                     |
| GITHURAI 44   | 76,171                        | 107,446                   | 144,399                     |
| KAHAWA WEST   | 53,692                        | 75,738                    | 101,786                     |
| CLAY WORKS    | 63,235                        | 89,199                    | 119,876                     |
| KASARANI      | 13,476                        | 19,009                    | 25,546                      |
| MWIKI         | 51,582                        | 72,761                    | 97,785                      |
| <b>TOTALS</b> | <b>316,716</b>                | <b>446,759</b>            | <b>600,407</b>              |

Source: Provincial Commissioner, Nairobi, 2013

### 5.9.1 Administrative sub-divisions

Nairobi County is one of the 47 counties in Kenya and it is the capital city of the republic. The county has 17 Parliamentary constituencies and the study areas situated in the following constituencies:

- Roysambu constituency
- Kasarani constituency

**Table 5-4: Administrative Units**

| <b>Constituencies</b> | <b>Wards</b>  |
|-----------------------|---|
| <u>Roysambu</u>       | Githurai<br>Kahawa West<br>Zimmermann<br>Roysambu<br>Kahawa |
| Kasarani              | Clay City<br>Mwiki<br>Kasarani                              |

Source: Provincial Commissioner, Nairobi, 2013

### **5.9.2 Power Supply**

The areas are well served with electricity, which is supplied by Kenya Power and Lighting Company (KPLC)

### **5.9.3 Road network**

Zimmerman can be accessed through Thika Road, Kamiti road or Northern Bypass. Githurai 44 is accessed through Thika road, Kamiti road and Eastern Bypass while Kahawa West is accessed through Kamiti road and Eastern By-pass. Clay Works is accessed by Thika road and Kasarani Mwiki road while Kasarani area is accessed by Thika road and Kasarani Mwiki road. Mwiki area is accessed by Kasarani – Mwiki Njiru road and a railway line.

### **5.9.4 Social and Economic activities.**

There are multi storied buildings housing numerous small businesses in these areas. The numerous micro and small businesses in the areas suggests that the informal sector drives the local economy offering business and employment opportunities. There are also medium and large businesses like super markets, petrol stations, financial institutions such as banks and Micro Finance Institutions (MFIs), hotels, clubs etc

Public facilities and offices include schools, local administration offices e.g. chiefs, DOs etc. There are numerous private kindergartens, primary and secondary schools. There is a County market in Kahawa West area.

## **6.0 PUBLIC PARTICIPATION AND CONSULTATION**

### **6.1 Introduction**

Public Consultation is very important and an integral part of the ESIA process, which is a legal requirement as it is put in Environmental (Impact Assessment and Audit) Regulation, 2003 and a very important tool for collection of data and specifically the baseline/background information. It helps bring out the contentious issues and gives a chance to those who may be affected by proposed project to give views, inputs and opinions and any significant issue is addressed at the initiation stage. This enables evaluation of the public and neighbors' views and is thus very important. The broad objective of the Public Consultation Process was to provide a platform for information sharing and opinion gathering in relation to the proposed project. The specific aims of the consultation process is; to get views and concerns thereby minimize conflicts and delays in implementation; facilitate the development of appropriate and acceptable entitlement options; increase long term project sustainability and ownership and reduce problems of institutional coordination.

In conformity to the environmental legislation, public consultations were held using interviews, questionnaire survey and consultative meetings to inform project affected people that the project is being undertaken, to record and understand any concerns. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made.

Community members were mobilised through the provincial administration (local chiefs) and the MCAs. The public consultations took the form of public meetings (barazas), which brought together representatives from the larger community including PAPs, local leaders such as chiefs and assistant chiefs and Members of the County Assembly. Key informant interviews were also conducted and questionnaires used gather information from the project beneficiaries. Participants were then taken through details of the proposed projects. They were then informed of the reasons why the meeting was important and the need for them to raise any issues that in their opinion were important for the success of the projects. Participants were encouraged to be open and to feel free in expressing their opinion.

The participants were given an opportunity to ask questions and highlight other issues of concern to them. The issues raised were then analyzed and presented to the proponent. The main findings and feedback from these events is summarised within this section while copies

of the lists of attendees at the various consultations and minutes of the meetings are provided in Appendix of this report.

**Table 6.1: List of stakeholders consulted**

| Name   | Category              |
|--|-----------------------|
| County Environment Officers                            | Key Informants        |
| Nairobi Water and Sewerage Company                     | Project Proponent     |
| Land/Property owners                                   | Project beneficiaries |
| Community leaders                                      | Project beneficiaries |
| Ziman Land Owners                                      | Project beneficiaries |
| Provincial Administration(Chiefs and Assistant Chiefs) | Key Informants        |
| Members of the County Assembly                         | Key Informants        |
| Nairobi County Officials                               | Key Informants        |
| Church Representatives                                 | Key stakeholders      |

**Table 6.2: List Schedule of stakeholders Meetings**

| VENUE THE MEETING                  | DATE OF THE MEETINGS/BARAZAS |
|------------------------------------|------------------------------|
| MCAs Office – Planning Meeting     | 13/02/2017                   |
| Githurai 44 Youth Empowerment Hall | 19/02/2017                   |
| Kasarani Youth Empowerment Hall    | 21/02/2017                   |
| Kahawa West MCAs Office            | 24/02/2017                   |
| Njathaini                          | 25/02/2017                   |
| Zimmerman ACK Church               | 4/03/2017                    |
| Ziman AP Post                      | 11/03/2017                   |

### Public Participation Meetings - Photos



Plate 1: Stakeholders meeting at Njathaini



Plate 2: ESIA Team engaging landowners



Plate 3: Stakeholders meeting at Githurai 44



Plate 4: Stakeholders meeting at Kahawa West



Plate 5: Stakeholders meeting at Ziman

## 6.2 Consultation Outcomes

Generally the qualitative results show that the proposed project was endorsed by all and eagerly awaited for. The respondents' reaction suggests that the proposed sewerage project would have more positive impact than negative. The landlords said that they were eagerly waiting for the project and it would change their lives positively. They have the feeling that after the completion of the project, they expect a reduction in water borne diseases like Cholera, typhoid, diarrhea etc. Currently the landlords spend approximately 50,000 to build septic tanks and a further Kshs 10,000 to empty the septic tanks when full.

### 6.2.1 Positive comments about the project from the participants

- Employment opportunities
- Improved value and general aesthetic of the area
- Improved standards of neighborhood

- Increased business in the area
- Availability and accessibility to water and proper sanitation
- Improved aesthetic

### **6.2.2 Suggestions made by the participants**

Reactions from stakeholders and participants were diverse but all were similar in the concern. One of the main concerns was payments of sewer connections. The issue of criteria of hiring of casual workers was also raised. Residents suggested that casuals be sourced from locals. In summary, the respondents welcomed the project because of the various advantages associated with such project but also indicated of the need the government to look into other infrastructures including roads. The issues raised and many others foreseeable have been adequately addressed in the report and in the ESMP.

### **6.2.3 Expectations from the participants**

- Main expectation of the residents after the construction is better sanitation conditions which may reduce water borne diseases.
- That the proposed project would give the residents a sense of belonging in the area they live and pride in residing in the area. For the landlords they would be able to retain the tenants in the house.
- Children will be able to play freely without the risk of getting sick because of playing with dirty water from the bathrooms and kitchens that flows out of the houses onto the roads
- Cleaner environment. Observations of the target area that confirmed that sometimes the septic tanks get filled and overflow.
- Cleaner toilets
- Job opportunities for the youth. This would keep the youth busy away from getting involved in criminal activities. This meant that security in the areas will improve substantially

There was no objection to the proposed project by any member of the community. They however reiterated that more emphasis should be put towards ensuring that the proposed project is implemented soonest possible. Most of those interviewed welcomed the development of this project in the area.

#### **6.2.4 Response from Proponent**

After going through issues raised by the residents, the proponent will ensure that all are implemented through:

1. Sourcing of materials and other services from the local community;
2. Employ the locals as skilled and semi-skilled labourers;
3. Put measures in place to protect environment, people and their property;
4. And above all observe Statutory and Regulatory Requirements;

Note: All the environmental and social concerns raised have been covered by the report.

#### **6.2.5 Continuous Community Engagements**

While this ESIA reports on the consultation and disclosure undertaken as part of the EIA process, it is acknowledged that consultation is an ongoing process and forms part of the life cycle of the project. The proponent will therefore ensure that the community and stakeholders continue to be informed during project implementation. Throughout the project, consultation and sensitization will continue to be undertaken by the proponent

## **7.0 ENVIRONMENTAL AND SOCIAL IMPACTS**

### **7.1 Introduction**

Development programmes and projects usually result in environmental impacts of varied kinds and severity. They generally cause alterations to the bio-physical and social environment. On-site and offsite impacts can be induced during the construction of the facility, and later during its operation. Onsite impacts result from construction activities carried out within the construction site. The impacts of off-site work result from activities carried out outside the construction site yet are directly related to the project. The extent of impacts depends primarily on the environmental management practices that would be adopted during facility operation. Projects such as the proposed one may have some positive and negative impacts on the environment.

The positive impacts ought to be enhanced while the negative impacts, which are sometimes severe, should be identified during project planning stages and appropriately mitigated against. The impacts assessed cover the direct effects and any indirect, positive and negative effects of the development during construction, operation and in many cases possible decommissioning.

The likely significance of the impact is based in the identification and prediction of the magnitude of any impact caused by the project on

- A receptor (e.g. human beings, community facilities, etc.)
- An environmental resource (elements of the existing natural or built environment),
- Any process which is essential, or of value, to the functioning of human or natural systems
- The importance (sensitivity) of that receptor/environmental resource/process.

The impacts arising during each of the phase of the proposed project namely construction, operation and decommissioning, can be categorized into:

- Impacts on biophysical environment
- Health and safety impacts; and
- Social-economic impacts

The assessment was done based on severity of impacts, spatial scope and the duration of the impact. The table below summarizes the assessment criteria for significant impacts.



**Table 7.1: Assessment criteria for significant impacts**

| <b>Severity of Impact</b>                                 | <b>Rating</b> | <b>Scoring</b> |
|---|---------------|----------------|
| Insignificant / non harmful/less beneficial               | -1/+1         | Very Low       |
| Small/ Potentially harmful / Potentially beneficial       | -2/+2         | Low            |
| Significant / slightly harmful / significantly beneficial | -3/+3         | Medium         |
| Great/ harmful / beneficial                               | -4/+4         | High           |
| Disastrous/ extremely harmful / extremely beneficial      | -5/+5         | Very high      |
| <b>Spatial Scope of the Impact</b>                        | <b>Rating</b> | <b>Scoring</b> |
| Activity specific   | -1/+1         | Very Low       |
| Right of way specific                                     | -2/+2         | Low            |
| Within Project area 5km radius                            | -3/+3         | Medium         |
| Regional  | -4/+4         | High           |
| National  | -5/+5         | Very high      |
| <b>Duration of Impact</b>                                 | <b>Rating</b> | <b>Scoring</b> |
| one day to one month                                      | -1/+1         | Very Low       |
| one month to one years                                    | -2/+2         | Low            |
| Within Project construction period                        | -3/+3         | Medium         |
| within the Project life                                   | -4/+4         | High           |
| at decommissioning  | -5/+5         | Very high      |

**Positive Impacts:**

Positive impacts will include the following:

- Reduction of health risks associated with exposure of residents with improperly drained sewage in their surroundings.
- Reduction of water borne diseases resulting from possible microbial pollution of drinking water obtained from contaminated shallow wells, or through suction of contaminated water in water supply pipes through accidental negative pressures in water pipes.
- Improvement in groundwater quality through preventing infiltration of sewerage from porous cesspits.
- Improve living conditions for residents through achieving the above environmental benefits, and contribute in alleviating poverty conditions through work opportunities in construction and operation of the project

- Achieve economic benefit by saving some healthcare expenses, improving people's productivity and improving water resources management.
- Employment of locals as skilled, semi-skilled and unskilled workers
- Growth of secondary businesses in the project area.
- Improved state of sanitation and hygiene in the target informal settlements with the overall effects of acceptable habitation
- Improved aesthetic.
- Construction labour will be provided by the local communities (mainly the youth and women) contributing a direct economic benefit to the residents.

## **Negative Impacts**

### **1. Solid Waste Generation:**

Solid waste will be generated during the construction phase. These will include metal cuttings, rejected materials, surplus materials, paper bags, empty cartons, and empty paint among others. Solid wastes if not well managed have a potential of causing disease outbreaks due to their presence. They are also a nuisance.

### **2. Noise and Vibrations**

The machines are potentially noise emitters, though the ambient noise levels are expected to be generally higher than the anticipated levels. Noise and vibrations effects expected to be low as hand labour is desired (with low noise generation) and all works will be undertaken during the day.

### **3 .Drainage and Hydrology:**

There may be potential but temporary disruptions of surface runoff during construction of sewer extensions. This could directly affect the immediate residential houses and access roads during heavy rains.

### **4. Workers accidents and hazards during construction**

During construction of the site of the proposed project, it is possible that workers may encounter occupational health hazards as a result of coming into contact and handling hazardous waste and injuries from hand tools.

### **5. Health and Safety**

Disruption of accumulated waste materials could expose the residents to risks of environmental health problems during the period of construction, handling of the waste materials and contaminated surface runoff has direct health implications to the workers and

the residents who gets into contacts, especially children, and any trenches and open excavated areas are potentially risky.

### **Impacts from Operations to the Receiving Environment**

#### **1. Solid Waste generation**

Solid waste from operations (tissues, sanitary towels etc.) may pose environmental hazards if not well managed.

#### **2. Soil and water contamination**

Among the anticipated impacts from the operations include the following: potential overflow of sewage from the immediate manholes into open drains risks contamination of surface runoff and hence peoples' health. The pour flush toilets become a nuisance to the immediate neighborhoods from undesirable odors if the level of cleanliness is not well maintained.

#### **3. Health and Safety Concerns**

Dumping of solid waste into the manholes may cause blockages hence sewer overflows. This could cause sewer blockages which could impact negatively to the health of the communities.

### **Socio Economic Impacts**

The overall economic impacts from the project will be positive. There will also be opportunities for raising incomes from repairs of the infrastructures. In addition, provision of these infrastructures there will be an overall impact of improved water and sanitation services and general aesthetics. The proponent is advised to utilize the lateral lines which are constructed in areas where there are way leaves to avoid interfering with structures and businesses. In some areas social and or economic disruptions are inevitable. A relocation action plan should be developed in order to compensate people affected by projects(PAPs).

## **8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

This Environmental and Social Management Plan (ESMP) provides a logical framework within which the negative environmental and social impacts identified during the ESIA study can be mitigated and any beneficial environment effects can be enhanced. It involves risk management strategies that should be undertaken by the project proponent and all stakeholders to mitigate environmental degeneration. There are approaches to monitor, control, reclaim and restore the environment back to its appropriate state. ESMPs for projects thus provides logical frameworks within which the identified issues of environmental concern can be mitigated or monitored i.e. provide a checklist for project monitoring and evaluation. Environmental monitoring involves measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. Monitoring aims at determining the effectiveness of actions to improve environmental quality.

The environmental management and monitoring plans has been developed to bring home the key findings of the environmental impact assessment; recommending necessary mitigation actions, defining roles, monitoring indicators and the estimated cost. The Contractor will also be required to prepare a separate and specific ESMP for their works in order to control construction impacts and ensure compliance with applicable environmental and health and safety legislation and standards. The Proponent (NCWSC) will ultimately be responsible for ensuring that the ESMP is implemented on site via reviewing the Contractor's ESMP and ensuring its implementation on site via audits.

The ESMPs outlined in the table below addresses the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs, timeframe and monitoring indicators that can help to determine the effectiveness of actions to upgrade the quality of environment; as regards the proposed project. The ESMPs have considered both the construction, occupational and decommissioning phases.

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

**Table 8.1: Proposed ESMP during the Construction Phase of the Project**

| Activity                               | Associated Impacts   | Impact Levels | Proposed Mitigation Measures  | Responsibility | Monitoring Indicator                           | Cost (KShs)    |
|--|--|---------------|---|----------------|--|----------------|
| Excavations and associated earth works | -Health and Safety risks<br><br>-Air pollution<br>-Noise       | Medium        | <ul style="list-style-type: none"> <li>• Provide notices, signage and information to the public</li> <li>• Install barriers along walkways, crossings and public places affected by the works</li> <li>• Inform residents of the activities to be undertaken.</li> </ul>  | Contractor     | Number of Accidents/incidences reported        | 150,000        |
|  | Destruction of vegetation cover                                | Low           | Construction activities will be limited to Project sites / routes which already exist therefore limited destruction to vegetation cover   | Contractor     | Extent of soil erosion and exposure            | No direct cost |
| Solid Wastes generation and disposal   | Risks of contaminating surface and underground water resources | High          | <ul style="list-style-type: none"> <li>• Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal</li> <li>• Contract a NEMA licenced waste handler to transport waste</li> <li>• Encourage recycling where possible (concrete debris for access road surfacing)</li> <li>▪ Material residuals to be disposed off in accordance with established regulations</li> </ul> | Contractor     | Number of complaints from the public/residents | 175,000        |

|  |   |        |  |                                |   |         |
|--|---|--------|--|--------------------------------|---|---------|
| Noise and Vibration from plant and equipment                           | Risk to health and safety of community and workers                            | Medium | <ul style="list-style-type: none"> <li>The Contractor shall keep noise level within acceptable limits and construction activities shall be confined to normal working</li> <li>The Contractor must adhere to Noise Prevention and Control Rules of April 2005</li> </ul> | Contractor/Resident engineer   | Reported complaints from neighbor community and institutions  | 150,000 |
| Sanitation issues resulting from both solid and liquid wastes on site. | Risks associated with water borne diseases exposed to community and workforce | Medium | <ul style="list-style-type: none"> <li>The Contractor shall observe and comply with the laws relating to public health and sanitation</li> </ul>   | Contractor/Resident engineer   | Incidence of reported cases of water related diseases among the workforce and neighbor community                              | 265,000 |
| Setting out and clearance of Project routes and site                   | Delay in Project implementation due to opposition from PAPS                   | High   | <ul style="list-style-type: none"> <li>Ensure that land acquisition is done within the provision of Land Act 2012</li> <li>Prepare and Implement RAP recommendations before commencement of civil works</li> </ul>   | Contractor and Proponent(NWSC) | <ul style="list-style-type: none"> <li>Numbers of satisfied PAPS</li> <li>Extend of route opened to the contractor</li> </ul> | 50 M    |

|                                      |   |      |  |                              |   |             |
|--------------------------------------|---|------|--|------------------------------|---|-------------|
| Air Quality Control                  | Air pollution   | High | <ul style="list-style-type: none"> <li>• The contractor shall not carry out dust generating activities (excavation, handling and transport of soils) during times of strong winds</li> <li>• Vehicles delivering soil materials shall be covered to reduce spills and windblown dust</li> <li>• Water sprays shall be used on all earthworks</li> </ul>  | Contractor/Resident engineer | Number of reported cases as a result of air pollution | TBD         |
| Occupational Health and Safety Risks | Risks of Accidents, Injuries, or death of workers or community member | High | <ul style="list-style-type: none"> <li>▪ Provide workers with adequate and appropriate personal protective gear (gloves, gum boots, overalls and helmets)</li> <li>▪ Provide temporary toilets and bathrooms for the construction workers at the work sites</li> <li>▪ Provide onsite first aid kit accessible by the workers on need</li> <li>▪ Isolate the site for access by the local communities during the construction for their safety and health</li> <li>▪ Develop a Healthy and Safety Plan</li> <li>▪ Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency</li> </ul> | Contractor/Resident engineer | Accidents occurrence incidences                       | KShs. 1.35M |

|                             |  |        |   |                               |  |                |
|-----------------------------|--|--------|---|-------------------------------|--|----------------|
| Local Labour / Employment   | Delay in Project implementation due to opposition from aggrieved community members | Medium | <ul style="list-style-type: none"> <li>Wherever possible, the Contractor shall use local labour, and women must be encouraged to be involved in construction work</li> <li>The contractor shall ensure compliance to the gender balance as required by the 2/3 gender rule</li> </ul>   | Contractor                    | Number of workers from the surrounding communities | No direct cost |
| Traffic management on site  | Risks of Accidents, Injuries or death of workers or community member               | high   | <ul style="list-style-type: none"> <li>Strict use of warning signage and tapes where the trenches are open and active sites</li> <li>Employ and train road safety Marshalls who will be responsible for management of traffic on site</li> <li>Contractor to provide a traffic management plan during construction to be approved by the resident engineer</li> </ul> | Contractor/ Resident engineer | Accidents occurrence incidences                    | KShs. 125,000  |
| HIV/AIDS awareness campaign | Risks of Increased HIV and Aids transmission in the area                           | Medium | The Contractor shall conduct awareness campaigns  | Contractor                    | -Number of awareness campaigns held                | KShs. 85,000   |

**Table 8.2: Proposed ESMP during the Operation Phase of the Project**

| Issue  | Action required   | Monitoring Indicator  | Responsibility | Provisional Budget  |
|--|---|-----------------------|----------------|---|
| Encroachment and construction of structures on the sewer wayleaves | <ul style="list-style-type: none"> <li>-Ensure the wayleaves are gazetted</li> <li>-Regular inspection of the wayleaves.</li> </ul> | cases of encroachment | Proponent      | Budget to be provided during the operation phase of the project |



|  |   |   |       |  |
|--|---|---|-------|--|
|  | -Conduct public awareness on the importance of the sewer lines  |   |       |  |
| Possibilities of soil pollution  | -Education campaigns on the risks and dangers of raw sewer<br>-Develop a preventive maintenance programs for sewers<br>-Fix sewer blockages on time | Number of educational campaigns conducted       | NCWSC | Budget to be provided during the operation phase of the project                    |
| Vandalism of the infrastructure (Manhole covers and man hole step irons) | -Use of non-recyclable materials for manhole covers<br>-Conduct Sensitization   | -Case of vandalism<br>-Manholes reported stolen | NCWSC | To be established at operation phase and included in the operation of the projects |
| illegal connection to the Sewer pipeline                                 | -Regular inspection<br>-Conduct public awareness  | Number of illegal connection                    | NCWSC | TBD during operation phase   |
| Sewer Blockages  | Awareness rising among community members not to dump solids in manholes.  | Number of blockages                             | NCWSC | TBD during operation phase   |

**Table 8.3: Decommissioning Phase**

| Issue                  | Action Required                                  | Responsibility | Monitoring indicator | Oversight | Frequency | Budget |
|------------------------|--|----------------|----------------------|-----------|-----------|--------|
| Solid waste generation | Collect, segregate and dispose waste responsibly | Contractor     | Records              | NEMA      | Daily     | TBD    |
|                        | Contract a licensed                              | Contractor     | Records/agreement    | NEMA      | Once      | TBD    |

|  |   |           |                                 |             |              |     |
|--|---|-----------|---------------------------------|-------------|--------------|-----|
|  | waste handler to dispose the wastes   |           |                                 |             |              |     |
|  | Inform stakeholders   | Proponent | Communication/<br>Memos/notices | Sociologist | Once         | TBD |
|  | Inform the relevant authorities.  | Proponent | Approval letters.               | Sociologist | Regularly    | TBD |
|  | Rehabilitate/restore the site to its original state as much as is practical | Proponent | Site observation                | NEMA        | Periodically | TBD |

## **9.0 OCCUPATIONAL SAFETY AND HEALTH AND EMERGENCY RESPONSE**

### **9.1 The Guiding Principles to be adopted by the contractor**

The Construction Company will be guided by the following principle:-

1. It will be a conscious organization committed to the promotion and maintenance of high standards of safety and health for its employees, and the public at large;
2. Ensuring that OSH activities are implemented to protect the environment and prevent pollution;
3. Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbours of the project and the environment, with the greatest safeguards relating to OSH;
4. Employees will be expected to take personal responsibility for their safety, safety of colleagues and of the general public as it relates to the OSH Management Plan.
5. The contractor shall develop a site specific ESMPs

### **9.2 Emergency procedure during construction and operation**

1. An emergency situation means unforeseen happening resulting in serious or fatal injury to employed persons or the neighbouring communities.

In the event of an emergency during construction, the workers shall:-

- a. Alert other persons exposed to danger;
- b. Inform the OSH coordinator;
- c. Do a quick assessment on the nature of emergency;
- d. Call for ambulance.

When emergency is over the OSH coordinator shall notify the workers by putting a message: "ALL CLEAR".

In the event of such an emergency during operation the workers shall: -

- a. Alert other persons exposed to danger;
- b. Ring the nearest police station, fire station and ambulance services.

The proponent has already put measures to respond to emergencies like emergency sewer blockages by having a USSD Code where customers could register complaints. There are also community health workers who could assist in cases of emergencies

**Table 9-1: Health, Safety and Accident Prevention Action Plan**

| <b>Issue</b>                             | <b>Specific measures</b>  | <b>Responsibility</b>                                 | <b>Timing</b>                    |
|--|---|---|----------------------------------|
| <b>Project Design</b>                    | -Incorporation of health, safety and resource conservation measures in project design   | -Project Architect<br>-Structural and civil engineers | Design Stage                     |
| <b>Site organization and cleanliness</b> | -Keep construction material in correct place<br>-Always maintain cleanliness at construction sites  | -Proponent<br>-contractor                             | Construction stage               |
| <b>Accident prevention</b>               | -Safe handling of tools and machinery<br>-Use of appropriate PPEs<br>-Engagement of qualified personnel   | -Contractor<br>-Proponent<br>-Construction workers    | Construction                     |
| <b>Waste disposal</b>                    | -Provision of adequate waste disposal facilities at the sites<br>-Engagement of licensed waste handling and disposal company<br>-Reuse of certain materials | -Contractor<br>-Contracted waste disposal company     | All stages of project cycle      |
| <b>Tool and machinery safety</b>         | -Use of tools and machinery for designated job<br>-regular servicing of machinery<br>-proper storage of tools   | Construction company                                  | Construction stage               |
| <b>Emergency preparedness</b>            | -Keeping passages clear<br>-Training workers and residents on emergency preparedness<br>-Maintaining a well-equipped first aid kits                         | -Contractor<br>-proponent                             | All stages of project cycle      |
| <b>Site security</b>                     | -Control of visitors entry into the sites<br>-24 Hr security at the sites   | -Contractor<br>-security company                      | Construction                     |
| <b>Insurance</b>                         | -Insuring all workers involved in the project   | Contractor  | Construction and decommissioning |

## **10.0 PROJECT ALTERNATIVES**

### **10.1 Project Alternatives**

The consideration of alternatives is one of the more proactive sides of environmental assessment - enhancing the project design through examining options instead of only focusing on the more defensive task of reducing adverse impacts of a single design. This calls for the comparison of feasible alternatives for the proposed project site, technology, and/or operational alternatives. This analysis is often undertaken in order to determine whether the project can be implemented within an alternative which is sustainable than the one presented by the preliminary feasibility studies and engineering designs. Alternatives have to compare in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and acceptability by neighboring land users. In this chapter, consideration was made based on alternative parameters listed below.

- Project Location
- Project Technology
- Project Impacts to People Assets and Sources of Livelihood

#### **10.1.1 Alternative Layouts and Designs**

This involves looking at various possible alternative project designs and layouts. The main technological aspect considered during the design of the project was the gradient factor; the objective was to ensure that raw sewer flows by gravity to existing Nairobi, Ngong sewer trunk.

#### **10.1.2 Nil-Intervention or No Project Alternative.**

The ‘**No Project Alternative**’: this leaves the status quo, continuation of suffering by the residents. This is not a preferred option by either the beneficiaries or the proponent. If the Proponent takes no action, and does not lay sewerlines, impacts would be the “business as usual” poor sanitation, contamination of the water bodies and proliferation of water borne disease in the project areas. The anticipated environmental impacts resulting from implementation, and operation of the project, as proposed, would not occur. The No-Project Option is considered if the Project would not be implemented at all. This option is the most suitable

alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. Some of the specific impacts that would arise as a result of the No project option include:

- Continued pollution of the environment from raw sewage which is overflowing from blocked sewers as well as from filled up septic tanks or pit latrines.
- Increased cases of water borne diseases for the population in settlements within the project areas.
- Continued menace of raw sewage flowing in open drains and excessive solid waste generation.
- Continued health and occupational hazards to the population living within areas contaminated with raw sewage.
- Continued accumulation of persistent contaminants in the environment that would otherwise have been conveyed and treated in a central plant. These persistent contaminants over time will surpass the toxic threshold levels and result in irreversible major environmental, social and health problems, and further reduce available freshwater and food reserves.

From the analysis above, it becomes apparent that ‘no project alternative’ is not the appropriate alternative to the community and the proponents.

#### **10.1.3 Alternative Material and Inputs**

The choice of materials and inputs selected for the project shall be based on the stipulated laws, standards and specific.

#### **10.1.4 Comparison of alternatives**

Under the proposed Development Alternative, the project would create more efficient system for collection and disposal of waste water, alleviate sanitation problems in informal settlements in Nairobi and would provide employment directly to public. It would provide jobs for the workers during construction.

Under the NO Action Alternative, we shall continue with poor sanitation, contamination of the water bodies and proliferation of water borne disease in the project area. The

residents will continue using the inefficient system of faecal disposal hence significant environmental impacts.

Provided the Environmental impact mitigation measures are implemented as well as adoption of sound construction management practices, negative impacts will be avoided/minimized. However, commitments related to development alternative would ensure that potential impacts are minimized to levels of insignificance as envisaged in the EMP

### **Management Plan Principles**

The project should observe environmental protection requirements in accordance to the established laws and regulations to ensure sustainability. To realize this goal, acceptability by a majority of the beneficiaries and minimal effects to the physical environment will require to be integrated in the project through constant consultations, evaluations and review of the project. It is recommended that guiding principles specific to this project. Among the factors that need to be considered in this particular project implementation will include:

- Enhance integration of environmental, social and economic functions in the project implementation,
- Consider preventive measures towards possible social and economic disruptions that may arise from the project implementation in accordance with the laid down guidelines, and
- Ensure prevention of pollutants discharge into the drainage systems and pollution of public water bodies,
- The contractors and other players in the project activities be prevailed upon to implement the ESMP through a sustained supervision and continuous consultations,

### **Management Responsibilities**

In order to implement the management plan, it is recommended that an Environmentalist is identified to oversee environment and management aspects including pollution control, water loss control and equity access, management of sanitation and hygiene measures throughout the project area. The Environmentalist would also be expected to co-ordinate and monitor environmental management during construction and provide monitoring schedules. Other recommended participants could include NEMA and NCC. The responsibility relationship is as follows;

- The Environmentalist will ensure that the contractor is observing all measures associated with environmental protection
- He will also liaise with the NEMA on matters of environmental and social nature.
- A sociologist is recommended to directly interact with the local communities on social, economic and cultural matters for long term sustainability of the intervention projects.
- The National Environmental Management Authority (NEMA) through the County Coordinators shall be responsible of surveillance of environmental and social aspects of the project implementation.

## **10.2 Compensation Issues**

In order to minimize project impact to private assets and sources of livelihood, the consultant designed the proposed project on existing wayleaves. However the topography of the area in some sections has influenced the proposed sewer to pass through private land. This calls for way leave acquisition in these areas. Where the proponent will interfere with property in order to acquire sewer wayleave, a compensation action plan/framework shall be prepared as a separate report based on AFBD guidelines, Kenyan law and procedures and precedents established in Kenya. The procedure should incorporate objective assessment compensation, investigation and analysis to determine the nature of each particular case.

## **11.0 CONCLUSIONS AND RECOMMENDATION**

### **11.1 Conclusion**

There is high appreciation of the intervention projects from the residents, majority who are. Overall, the project will have significantly positive impacts on the environment. The assessment has highlighted the potential negative and positive impacts of the proposed project. The benefits (environment, economic and social) accruing from implementing the project outweigh the negative impacts. The negative impacts are short term and can easily be mitigated by the proposed measures. The positive impacts are long-term and have a multiplier effect on the three pillars of sustainable development: social,



environment and economy. Successful implementation of the proposed project will increase access to sewerage /sanitation services thereby contributing positively to MDG goal 7 on environmental sustainability as well as Kenya's vision 2030. The project is highly recommended for implementation. The ESMP should form part of contract documents to compel the implementing stakeholders to follow it through. It can be concluded that the proposed project is environmentally, legally, socially and culturally acceptable.

## **11.2 Recommendation**

Based on the above observations, it is concluded that nothing in this ESIA findings will result into significant negative effects on the environment, as long as the mitigations proposed in the ESMP guidelines are implemented. In-fact the proposed modifications will help to solve some of the environmental problems which may arise from the inefficient collection, conveyance and treatment of faecal waste. It is our consideration that the proposed development is timely venture thus we recommend that the project be allowed to go ahead with the implementation provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be addressed by following and implementation of the recommended Environmental Management and Monitoring plans (ESMPs).

It is therefore recommended that;-

- The proponent should be given all the available support to implement the project.
- Ensure sustainability of accruing impacts to be fully realized by considering use of locally available casual labor instead of "importing" workers, capacity building for various targeted facility management groups in management, operation and maintenance, beneficiary participation from outset of the project implementation,
- Ensure adequate awareness , sensitization on the importance of proper sanitation
- Sound construction practices aimed at environmental conservation should also be adopted and special attention should be paid to the extended sources of raw materials such as water, sand

- The project proponent should work closely with the environmental experts, engineers and other bodies to enhance the facilitation of the issues of concern such as standard construction, water supply and waste generation and management. This will help in solving any problem arising and which may not have been foreseeable during the ESIA project report study.
- The licensing authorities should issue the necessary licenses so that the work can commence.

## LIST OF REFERENCES

- Republic of Kenya (2005); Kenya Gazette Supplement Acts 2000, *Environmental Management and Coordination Act (EMCA) No. 8 of 1999*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Environmental (Impact Assessment and Audit) Regulations 2003*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Land Control Act (Cap. 302)*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Local Authority Act (Cap. 265)*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Occupational Health and Safety Act, 2007*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Penal Code (Cap. 63) Revised Edition 2009*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Physical Planning Act, 1996 (Cap. 286) Revised Edition 2009*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Public Health Act, 1986 (Cap. 242), Revised Edition 2012*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Sessional Paper No. 6 of 1999 on Environment and Development*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Way-leaves Act, 1989 (Cap. 292) Revised Edition 2010*, Government Printer, Nairobi
- Republic of Kenya (2005); Kenya Gazette Supplement Acts, *Wildlife (Conservation and Management) Act 1985 (Cap. 376), Revised Edition 2012*, Government Printer, Nairobi
- Republic of Kenya (2006); Kenya Gazette Supplement Acts, *Environmental Management and Coordination (Waste Management) Regulations, 2006*, Government Printer, Nairobi
- Republic of Kenya (2008); Kenya Gazette Supplement Acts, *Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2008*, Government Printer, Nairobi
- Republic of Kenya (2009); Kenya Population Census 2009, Government Printer, Nairobi
- Republic of Kenya (2011); Kenya Gazette Supplement Acts, *Urban Areas and Cities Act No. 13 of 2011*, Government Printer, Nairobi
- United Nations (1992); *Rio Declaration on Environment and Development*, Rio de Janeiro
- United Nations (1987); *World Commission on Environment and Development*
- Environment Impact Assessment Guidelines and Administrative procedures.
- World Banks Operational Safe guard Policies
- Gath Consulting Engineers – Engineering Services for Design and Documentation of Primary and Secondary Sewer lines (Riruta and Kawangware) – Detailed Design Report

## APPENDICES

### Appendix 1. Paul Karanja Mbugua Practicing License (Lead Expert Number 7957)

FORM 7 (r.15(2))



**NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)**  
**THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT**

**ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE**

License No : NEMA/EIA/ERPL/3622  
Application Reference No: NEMA/EIA/EL/5500

M/S **Paul Karanja Mbugua**  
(individual or firm) of address  
P.O. BOX 17285-00100, Nairobi

is licensed to practice in the  
capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**  
registration number **7957**  
in accordance with the provision of the Environmental Management and Coordination Act, 1999

Issued Date: **4/26/2016**      Expiry Date: **12/31/2016**

Signature.....



(Seal)  
**Director General**  
**The National Environment Management Authority**

P. T. O.



## APPENDIX 2: MINUTES OF STAKEHOLDERS MEETING

### Minutes of the Stakeholders meeting on-24th Feb 2017—at the MCA's office Kahawa west

Attendance – As per attached List

#### AGENDA

- A brief of the proposed project and its impacts
- Residents Expectations/ opinions
- Resolutions
- AOB

| Sno | AGENDA   | DELIBERATIONS   |
|-----|--|---|
| 1   | <b>Min 1:<br/>Prayer and Introduction</b>                        | <p>-The meeting was called to order at 10.00am, by Paul Karanja who chaired the meeting</p> <p>-It was opened with a word of prayer by one of the attendants.</p> <p>-The MCA welcomed everyone in attendance and encouraged them to air their views concerning the project</p> <p>- The chairperson explained the purpose of the meeting and the agendas</p> <p>-The chairperson explained to the participants that Public Participation is one of the most important aspect of ESIA process and that it is a requirement by NEMA</p>                                  |
| 2   | <b>Min 2:<br/>Brief of the proposed project and its impacts:</b> | <p>-An overview of the project was done and the possible impacts pointed out.</p> <p>-A presentation of the proposed project was done including the proposed design</p> <p>-Anticipated environmental and social impacts and necessary mitigation measures were discussed</p>   |
| 3   | <b>Min 3:<br/>Residents Expectations:</b>                        | <p>-The residents embraced the project and felt that it was for the good of the community</p> <p>-That they expect the contractor to employ local residents</p> <p>-That the proposed project will be a big relief as septic tanks overflow during rainy seasons</p> <p>-The landlords said that they were eagerly waiting for the project and it would change their lives positively</p> <p>- Expect reduction in water borne diseases like Cholera, typhoid, diarrhea etc.</p> <p>-That the project shall reduce the cost of emptying the septic tanks when full.</p> |

|   |                                |  |
|---|--------------------------------|--|
|   |                                | <ul style="list-style-type: none"> <li>-That they expect politicians not to interfere with the project</li> <li>-Fear of increased rents as a result of better sanitation but were of the opinion that after implementation of the project the benefits shall be more</li> <li>-Residents sought to know what will happen to the areas not served by the trunk like Kiwanja and Kamae villages</li> <li>-Those that connected earlier to the sewer have problems of blockages</li> </ul>                                 |
| 4 | <b>Min 4:<br/>Resolutions:</b> | <ul style="list-style-type: none"> <li>-Participants resolved to support the proposed project as they are convinced that it is for the benefit of all the residents.</li> <li>-Resolved to have a dispute resolution mechanism in case of any arising issue concerning the project</li> <li>-Resolved to give way for the proposed project for those who may have encroached the wayleaves</li> <li>-Resolved to work closely with the proponent and the contractor once the project implementation commences</li> </ul> |
| 5 | <b>Min 5<br/>AOB:</b>          | <ul style="list-style-type: none"> <li>-A resident raised an issue that water is a big problem especially in Kiwanja Village</li> <li>- That there is need to have a customer care office in the area and continuous community engagement during the project implementation</li> <li>-Having no other business the meeting adjourned at 1.00pm.</li> </ul>   |

**Minutes Signed:**

Secretary .....Date.....

Chairman .....Date.....

### **APPENDIX 3: LIST OF PARTICIPANTS**

## **APPENDIX 4: QUESTIONNAIRES**



#### APPENDIX 4: PUBLIC PARTICIPATION PHOTOS



A Public Baraza in Ziman



Stakeholders meeting at Githurai 44



Consultation meeting at Githurai



Stakeholders meeting at Njathaini



Land owners meeting at Kahawa west



Baraza at AP post ground at Zimmerman



Stakeholders meetings at Kasarani



Ward Administrator addressing land owners at Zimmerman



A section of participants at Zimmerman



stakeholders' consultation meeting

**APPENDIX 5: BILL OF QUANTITIES**  
**Summary of the Estimated Project Costs**

| <b>Bill No.</b> | <b>Description</b>   | <b>Amount (KSh.)</b>    |
|-----------------|--|-------------------------|
| 1               | Preliminaries and General Items  | 89,809,640.20           |
| 2               | Kahawa West  | 415,689,152.90          |
|                 | Githurai 44  | 378,760,663.89          |
|                 | Zimmerman and Roysambu   | 147,495,345.81          |
|                 | Kasarani   | 146,533,641.42          |
|                 | Clayworks  | 1,082,422,920.33        |
|                 | Mwiki  | 1,243,210,919.08        |
|                 | <b>SUBTOTAL 1</b>  | <b>3,503,922,283.62</b> |
|                 | ALLOW FOR CONTIGENCIES AT 10% OF<br>THE SUB-TOTAL TO BE EXPENDED IN<br>WHOLE | 350,392,228.36          |
|                 | <b>SUBTOTAL 2</b>  | <b>3,854,314,511.98</b> |
|                 | <b>ADD 16% V.A.T</b>   | 616,690,321.92          |
|                 | <b>TOTAL</b>   | <b>4,471,004,833.90</b> |

## **APPENDIX 7: DESIGN DRAWINGS**