Ministry of Water, Sanitation and Irrigation

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED WATER PROJECT INTERVENTIONS IN KISUMU CITY

FINAL ESIA REPORT

24 December 2024

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DECLARATION

This EIA report was done in accordance with the requirements of the Environmental (Impact Assessment and Audit) Regulations, 2003, pursuant to the Environmental Management and Coordination Act (EMCA) 1999 and acceptable international standards.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
DOSH	Directorate of Occupational Safety and Health
E&S	Environment and Social
EA	Environmental Audits
EIAs	Environmental Impact Assessments
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GoK	Government of Kenya
HIV	Human Immunodeficiency Virus
KWS	Kenya Wildlife Service
MDGs	Millennium Development Goals
NECC	National Environmental Complaints Committee
NEMA	National Environment Management Authority
NET	National Environmental Tribunal
NGEC	National Gender and Equality Commission
OP	Operational Policies
OSHA	Occupational Safety and Health Act
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
PPP	Public Private Partnership
RAP	Resettlement Action Plan
SDGs	Sustainable Development Goals
SEP	Stakeholders Engagement Plan
SHE	Safety, Health and Environment
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WRA	Water Resource Authority
DN	Diametre Nominal
VECs	Valued Environmental Components
DMAs	District Metering Areas

Table of contents

EXECUTIVE SUMMARY xii

1. INTRODUCTION 18

1.1. Background 18

1.2. Project objectives 18

1.3. Objective of ESIA study 19

1.4. Scope of this Report 19

1.5. Methodology 20

1.5.1. Desk Study 20

1.5.2. Understanding the project 21

1.5.3. Site Survey and Baseline Data Collection 21

1.5.4. Physical environment 21

1.5.5. Physical Cultural Resources 21

1.5.6. Biodiversity Assessment 21

1.5.7. Data Evaluation and Analysis 22

1.5.8. Public Consultations. 22

2. PROJECT DESCRIPTION 23

2.1. Geographic, ecological, general layout 23

2.1.1. Milimani DN350mm & DN 250mm Distribution Water Main Overhauls 23

2.1.2. Arina, Gudka & Lower Railways Estates Overhaul works 24

2.1.3. Kamaler-Guba Upgrade Works - 8400m, DN250: 29

2.2. Land required and its availability 31

2.3. Intervention design and construction processes 31

2.3.1. Intervention Design 31

2.3.2. Construction Process 33

2.4. Natural resources (water and construction materials) 34

2.4.1. Water Requirement 34

2.4.2. Construction Materials Requirements 35

2.5. Labour requirements 35

2.6. Waste generated 36

2.6.1. Excavated Material 36

2.6.2. Old Pipeline Materials 36

2.6.3. Residual Water and Sediment 36

2.6.4. Construction Waste 37

2.6.5. General Waste 37

2.6.6. Corroded Metal Pipes 37

2.6.7. Pipeline Coating and Insulation Materials 37

2.7. Applicable permitting process 37

3. LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK 39

3.1. Applicable County Laws 39

3.2. Applicable National policies, laws and regulations 40
3.3. Legal Framework 43
3.4. Regulations And Rules 48
3.5. World Bank Operational Safeguard Policies 51
3.6. World Bank Group Environmental Health and Safety Guidelines on Water and Sanitation 52
3.7. Relevant SDGs 52
3.8. Relevant Biodiversity Treaties 53
4. BASELINE INFORMATION 55
4.1. Physical Environment 55
4.1.1. Physiographic Characteristics 55
4.1.2. Ecological conditions 59
4.1.3. Climatic Conditions 59
4.1.4. Climate and Air Quality 60
4.1.5. Assessment of climate risks 61
4.1.6. Water Quality and Hydrology 62
4.1.7. Soil 64
4.1.8. Geology and Hydrogeology 64
4.1.9. Soil erosion, stability& Landslides 64
4.1.10. Land use 65
4.1.11. Major rivers and wetlands within the project AoI 71
4.1.12. Disasters and risks related to climate Change 71
4.2. Biological Environment 71
4.2.1. Forest & other Protected Areas within the project AoI 71
4.2.2. Wildlife and bird migrations within Project AoI 72
4.2.3. Farmland vegetation characteristics within Project AoI 72
4.3. Bio –Physical Environment 73
4.3.1. Terrestrial Flora 73
4.3.2. Terrestrial Fauna 73
4.3.3. Aquatic flora and fauna 73
4.4. Socio-Economic Environment 74
4.4.1. Demographic information 74
4.4.2. Land-Use 76
4.4.3. Status of Existing Water Resource Management Programs 76
4.4.2. Community Structure 76
4.4.3. Employment 77
4.4.4. Gender 77
4.4.5. Local Communities 77
4.4.6. Livelihoods, Income Sources, and Distribution of Goods and Services 77
4.4.7. Recreation 77

4.4.8. Cultural Properties 78
4.4.9. Education 78
4.4.10. Health 78
4.4.11. Waste Disposal 81
4.4.12. Community Participation, Customs, and Norms 81
4.4.13. Traditional Knowledge, Perception, and Aspiration 82
4.4.14. Social Amenities and Infrastructure 82
4.5. Additional sewage 82
5. PUBLIC CONSULTATION, PARTICIPATION AND STAKEHOLDER ENGAGEMENT 84
5.1. Introduction 84
5.2. Consultation method and approach used in ESIA 84
5.3. Stakeholder Consultation and Engagement 87
5.3.1. Public community meetings (Barazas) 87
5.3.2. Concerns/Issues/Questions raised during the Stakeholder Engagement 87
5.3.3. Summary of emerging issues presented during stakeholder engagement 90
5.4. Stakeholders' engagement during scoping phase 94
5.4.1. Key informant interview with national and County government administration officers 94
5.4.2. Consultation with business and industry actors 96
6. PAPS DEMOGRAPHIC PROFILE AND REGISTER 98
6.1. Overview 98
6.2. Methodology 98
6.3. Socioeconomic and Demographic Profile 98
6.3.1. Demographics 98
6.3.2. Business ownership 99
6.4. Impact Assessment 100
6.5. Entitlement Framework 101
6.6. Implementation Schedule 101
6.7. Budget and Funding 101
6.8. Monitoring and Evaluation Framework 102
6.9. Conclusion and Recommendations 102
6. PROJECT ALTERNATIVES 103
6.1. Section Overview 103
6.2. The "No-action" alternative 103
6.3. Project Design 103
6.4. Location 104
6.5. Layout 104
6.6. Preferred /Selected Alternative 105
7. PROJECT POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS AND MITIGATION MEASURES 106
7.1. Overview 106
7.2. Impact identification 106
7.2.1. Sources of impacts 106

7.2.2. Receptors of impacts 106
7.2.3. Impact Assessment Criteria 107
7.3. Impact Assessment Methodology 107
7.3.1. General 107
7.3.2. Identification of environmental aspects and impacts 107
7.3.3. Description of aspects and impacts 108
7.3.4. Spatial scope 108
7.3.5. Duration 109
7.3.6. Severity 109
7.3.7. Frequency of Activity 109
7.3.8. Frequency of the impact 109
7.4. Assessment of significance of impacts 110
7.4.1. General 110
7.4.2. Significance determination 110
7.5. Description of Feasible Alternatives 112
7.6. Mitigation 112
7.7. Existing environmental and social impacts 112
7.7.1. Encroachment of road reserve by development facilities 113
7.7.2. Encroachment of water pipeline way leaves 114
7.7.3. Inherited Old Networks 114
7.7.4. Rocky Terrain and Time Implications 114
7.7.5. Accessibility and Potential Conflicts 115
7.7.6. Interconnection with Other Lines 115
7.7.7. Possibility of Illegal Tapping 115
7.7.8. Road Crossings 115
7.8. Potential impacts and mitigation measures during construction phase 116
7.8.1. Disruption of businesses within the project area 116
7.8.2. Disruption of services within the project alignment area 116
7.8.3. Impact on access to premises 117
7.8.4. Impact on public infrastructure 118
7.8.5. Blockage of drainage channels 118
7.8.6. Accidents and Injuries to workers and residents 119
7.8.7. Health and safety risks to residents 120
7.8.8. Solid waste generation 120
7.8.9. Soil erosion 121
7.8.10. Air Pollution 121
7.8.11. Noise Impact 122
7.8.12. Water supply disruption 123

7.9. Potential impacts and mitigation measures during operation phase 127
7.9.1. Water system leaks and loss of pressure 127
7.9.2. Water Discharges 127
7.9.3. Deficiencies in water distribution system 128
7.10. Cumulative impacts 130
8. ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING PLAN 131
8.1. Introduction 131
8.2. Management Responsibilities 131
8.3. Environmental Management Guidelines 131
8.4. Environmental Education and Awareness Raising 132
8.5. Decommissioning Process 132
8.6. Environmental & Social Management Plan (ESMP) 132
8.7. Environmental & Social Monitoring 137
8.7.1. Internal Monitoring 137
8.7.2. External Monitoring 139
8.7.3. Environmental Audits (EA) 139
8.8. Grievance Management/Redress Mechanism 139
8.9. Framework for Implementation of the ESMP 142
8.9.1. Institutional Framework for implementation of ESMP 142
8.9.2. Organization Roles and Responsibilities 143
8.9.3. Training, Education and Competency 144
8.9.4. Assessment and Improvement 144
8.9.5. Incident Management 145
8.9.6. Reporting 145
8.9.7. Management Review 145
8.9.8. Liaison and Communication to Stakeholders 145
9. CONCLUSION AND RECOMMENDATIONS 146
9.1. Conclusions 146
9.2. Recommendations 146
APPENDICES 148
Appendix A- Minutes of the Community Meetings 149
Appendix B-Attendance List 180
Appendix C-Businesses along the wayleave that will be impacted by the project 182
Appendix D-Questionnaire Responses from Businesses along the Project area 186
Appendix E: PAPs Register 194

List of Figures

Figure 2-1: Google Earth showing location of Milimani proposed potable water networks overhaul ... 23
Figure 2-2: Google Earth showing location of Arina proposed potable water networks overhaul 25
Figure 2-3: Proposed pipeline crossing in front of Arina Primary and Junior Secondary school gate.. 25
Figure 2-4: Businesses along Arina proposed pipeline 25
Figure 2-5: Route of Arina proposed water networks overhaul 26
Figure 2-6: Google Earth showing location of Gudka proposed water networks overhaul..... 27
Figure 2-7*: Route of Gudka proposed water networks overhaul* 27
Figure 2-8: Google Earth showing location of Lower railways proposed water networks overhaul 28
Figure 2-9: The line passes along the fence below the power distribution line along the tarmac road then it enters the estate..... 29
Figure 2-10: Google Earth showing location of proposed water networks 30
Figure 2-11: Javic Junior school along the proposed water pipeline 30
Figure 4-1: Residential houses in Gudka Estate 57
Figure 4-2: Businesses along the road reserve near Arina Primary and junior secondary school..... 57
Figure 4-3: Residential land use in Arina Estate..... 57
Figure 4-4: Residential land use in Arina Estate..... 57
Figure 4-5: Gravellea trees 58
Figure 4-6: Eucalyptus trees 58
Figure 4-7:Eucalyptus polybractea species 58
Figure 4-8: Finger euphorbia..... 58
Figure 4-9: Drainage at Guba 59
Figure 4-10: Swampy area in Guba 59
Figure 4-11: Kisumu County Soil types..... 64
Figure 4-12: Residential land use in Gudka Estate 66
Figure 4-13: Sweet potato farming in Guba area..... 66
Figure 4-14: Pastoralism in Guba 66
Figure 4-15: Banana along the road 67
Figure 4-16: Maize farming 67
Figure 5-1: Public Baraza at Guba open ground 92
Figure 5-2: Public Baraza at Arina Estate..... 92
Figure 5-3: Public Baraza at Guba..... 92
Figure 5-4: Public Baraza at Arina Estate..... 92
Figure 5-5: Public Baraza at Guba..... 93
Figure 5-6: Public Baraza at Guba..... 93
Figure 5-7: Public Baraza at Guba..... 93
Figure 5-8: Public Baraza at Guba..... 93
Figure 5-9: Public Baraza at Gudka Estate..... 93
Figure 5-10: Public Baraza at Gudka Estate..... 93
Figure 7-1: Businesses along the road reserve in Arina Estate..... 114
Figure 7-2: Access road in Guba 117
Figure 7-3: pipeline route in Gudka Estate 117
Figure 7-4: Existing drainage at Guba area 119
Figure 7-5: Existing drainage at Gudka Estate 119

List of Tables

Table 1: Project equipment and facilities requirements 35
Table 2: Labour requirements for project operations 35
Table 3: Policy Framework Relevant to the Water Networks Project 40
Table 4: Legal Framework Relevant to Water Infrastructure 43
Table 5: Regulations and Polices 48
Table 6: World Bank Safeguard Policies 51
Table 8: Weather by month // weather averages Kisumu 60
Table 9: Kisumu County Population 74
Table 10: Population Projections (by Sub-County and Sex) 74
Table 11: Population Projections by Age Cohort 75
Table 12: Kisumu County Socio-economic indicators 78
Table 13: Social services access rates and poverty levels 81
Table 14: Principles of Participation and how they were ensured in the ESIA process 85
Table 15: Consultation Methods 85
Table 16: Key Stakeholders Consulted 86
Table 17: Venues, Date, Time, Attendance of Community Meetings 87
Table 18: Question/Issue Response Matrix 87
Table 19: Details of Stakeholder Engagement / Consultation undertaken for proposed water pipeline 94
Table 20: Sources of impacts 106
Table 21: Receptors of impacts 107
Table 22: Significance Assessment Matrix 110
Table 23: Positive and Negative Mitigation Ratings 111
Table 24: Framework for Assessing Environmental Impacts 111
Table 25:ESMP 133
Table 27: Roles of Safeguards Officers Engaged by the Contractor 144

EXECUTIVE SUMMARY

1. Introduction

The Ministry of Water, Sanitation and Irrigation (MoWS&I) is implementing Water and Sanitation Development Project (WSDP) with a credit from the International Development Association (IDA) that aims at improving water supply and sanitation services in selected regions in Kenya through the Water Service Providers (WSPs). The objective of this study was to evaluate the environmental and social impacts that are likely to emanate from construction, operation and decommissioning phases of the proposed project. We have, as a way forward suggested ways of minimising the identified adverse impacts and optimizing the positive impacts.

2. Proposed Project

The Project Development Objective (PDO) is to improve water supply and sanitation services and improve the financial performance of KIWASCO. The Arina and Gudka Overhaul Works will involve the complete overhaul of 8018 meters of water supply pipelines in these areas, targeting improved reliability and efficiency by reducing physical water losses due to leaks and bursts. The replacement of 4300 meters of asbestos and other pipelines (DN63, DN90, DN300, and DN225) in Milimani and Lower Railways areas will reduce health risks associated with asbestos, improve water quality, and decrease instances of pipeline bursts and leaks. Kamaler-Guba Upgrade Works will upgrade 8400 meters of water supply pipelines to DN250 specifications, resulting in increased water pressure and flow rates for a more consistent and reliable water supply.

3. Objective of the Project

The general objective of this project is to improve the water supply services within Kisumu city for the benefit of residents of the city.

4. Scope of works

The scope of work for the proposed potable water networks overhaul in Kisumu includes the design and implementation of overhauls for three critical projects: the DN350mm and DN250mm distribution water mains from Dunga Treatment Plant, and the water networks serving Arina, Gudka, and Lower Railways Estates. These projects aim to address issues of frequent bursts, leaks, and the resulting high non-revenue water (NRW) levels, which significantly affect service delivery and operational costs. The overhauls will involve replacing dilapidated, clogged, and brittle metallic pipelines with optimal diameter pipes (DN350, DN250, DN110, DN90, DN63, and DN32), addressing the challenges of low pressure, intermittent supply, and high maintenance costs.

5. Objective of ESIA study

The general objective of the ESIA investigations is to carry out a systematic examination of the present environmental situation within the project area to determine whether the proposed project will impact adversely on the physical and biological elements of the environment within the project area. This is in line with Section 58 (1) of EMCA 1999 that requires proponents to carry out ESIA on projects that appear in the Second Schedule of the Act.

6. Study methodology

The methodologies used in the study include identification, collection, and analysis of environmental baseline data; identification of impacts; analyses and evaluation of impacts; formulation of mitigation measures for significant negative impacts; development and analysis of project alternatives, and development of environmental/social management and monitoring plans.

7. Study findings

The study identified several critical issues that could impact the implementation of potable water network projects, including encroachment on road reserves and water pipeline wayleaves, inherited old networks, rocky terrain, and public accessibility conflicts. Additional challenges include illegal tapping, road crossings, service disruptions, damage to fences and infrastructure, drainage blockages, and risks to residents from construction traffic and sexually transmitted diseases. Environmental concerns such as solid waste generation, soil erosion, atmospheric pollution, and noise impacts were also noted, along with potential disruptions to water supply.

8. Public Consultation

Public participation in this project was achieved through consultation with the host community, business owners at Kisumu city, Project Affected Persons (PAPs). Also, the consultant carried out consultation with the lead agencies including: WRA, KeNHA, KURA, KeRRA, CECM Water, CECM Roads; Municipal Manager. This was done through direct interviews and questionnaire administration, and public barazas. It emerged from the stakeholders' consultation that the project is welcome in the area as they anticipate minimum negative impacts from its construction and operation. Though some PAPs were identified in CBD area who will be compensated for the loss of business.

9. Impact Assessment Criteria

The criteria applied in this study are based on industry standards for impact assessment, adopted for use in the assessment of the proposed project impacts. The purpose of impact assessment is to assign relative significance to predicted impacts associated with the project, and to determine the way impacts are to be avoided, mitigated or managed. The rating of impacts assumes that standard construction and operating procedures present in the project description will be implemented. The impact assessment criteria include the spatial context of project impacts; temporal context; and reversibility, magnitude and significance of potential impacts of project construction and operation. The potentially significant environmental and social impacts have been identified based on the nature of the receiving environment, analysis of the proposed activities and analysis of the issues raised by stakeholders during public participation process.

10. Environmental and Social Impacts and mitigation Measures

Environmental and social impacts associated with construction and operation phases of the proposed project include the following:

Environmental and social impacts	Mitigation Measures
Impact on business resulting in the Loss of revenue Impacts on business associated with the proposed project include informal and formal businesses comprising of flower vendor, general retail kiosk, shoe shiner,	(i) PAPs register has been undertaken and the register is in appendix E of this report. Compensation will be undertaken for loss of revenue. After compensation, the PAPs will be given sufficient notice to re-locate temporarily before excavation activities begin. They will be allowed to return back after the pipes have been

Environmental and social impacts	Mitigation Measures
general open-air kiosk, shoe selling, watches and belts kiosks. From the assessment, 21No. PAPs will be affected during project implementation. Most of these PAPs are situated along the Kisumu CBD and Milimani area. Also, the project will affect access to business buildings within CBD.	laid and trenches backfilled. The impacts will therefore be short term. (ii) In situations where the access to business premises will be affected, the contractor will provide alternative access and/or excavation works will be undertaken during weekends or at night (outside business hours). The contractor will restore the excavated sections after laying the pipe.
Impact on roads There are instances where the proposed project infrastructure will cross public roads at Arina, Gudka, lower railways and Guba thus disrupting traffic flow and affected the roads.	(i) Micro-tunneling will be undertaken on all major road crossings to avoid disruption of traffic and affecting the road surface. (ii) All excavated soil shall be used for backfilling of trenched areas and site restoration. (iii) Damaged road surfaces shall be adequately restored to pre-excavation conditions. (iv) Excess spoil materials shall be disposed of in approved tips in compliance with existing laws, rules and regulations
Blockage of drainage channels Drainage blockages due to temporary disruption of surface runoff because of the trenching along road reserve will be experienced.	(i) Contractor will provide temporary drainage if main channels are affected during excavations. (ii) Contractor will unclog all blocked storm water drainage channels. (iii) Working under dry weather conditions will be recommended.
Accidents and Injuries to workers and residents Work at the proposed site may involve hazards such as accidental falls into open trenches, slippery walkways, and heavy equipment which have the potential of causing accidents and injuries.	(i) The Contractor shall conform to all the stipulations of the Occupational Health and Safety Act, 2007. The Act requires the designation of a Health and Safety representative when more than 20 employees are deployed. (ii) The contractor shall provide ample warning signs, guard rails, warning tape, etc., around open excavations, stacks of material, debris, etc. and shall be held liable for all claims as a result of neglect of such precautions and provisions. (iii) Use of requisite Personal Protective Equipment (PPE) always during construction works (iv) Shoring of excavations especially manholes and other management measures (buttering, benching etc) of trenches
Solid waste generation Construction will result in the generation of various solid wastes, principally surplus aggregates, metal scraps, plastics and wood which will potentially lead to environmental pollution.	(i) Bins/ receptacles shall be placed at strategic locations within the site as collection centres to facilitate separation and sorting of the various types of wastes. (ii) Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable to the supervising architect and environmental consultant. (iii) Construction site management plans will be required for all works. This plan will include a waste management plan for all activities during the construction period.
Air Pollution The expected air pollutants from the proposed project will include dust, particulate matter and gaseous emissions from construction materials.	(i) Impose speed limits (10 km/h in all areas within the site boundaries). (ii) Damping down of access roads, stockpiles and cleared areas must take place to minimize dust pollution.

Environmental and social impacts	Mitigation Measures
Dust will be generated from the excavations, batching activities, earth moving and materials delivery. Particulate matter will be generated by dry construction materials including sand, cement, gravel, murram, etc.	(iii) Dust and air pollution due to dust when excavated material is stock piled, should be limited by means of wetting (particularly dry season), covering with foil or working in small sections so that the trenches are backfilled with excavated soil within shortest possible period (maximum 2 days).
Noise Impact Use of heavy construction machinery including excavators, plant and machinery will lead to relative noise levels. Fabrication of site equipment and concrete mixing both at the contractor's workshop and at the construction site will generate significant noise levels.	(i) Schedule road traffic movements to normal working hours (08H00 –17H00). (ii) Where need be, all exposed workers will be provided with functional earmuffs, whose use is mandatory, and closely enforced, monitored and supervised.
Sexual exploitation and abuse of community members by project workers This impact refers to sexual exploitation and abuse committed by Project staff against communities, and represents a risk at all stages of the Project, especially when employees and community members are not clear about prohibitions against SEA in the Project. The project will experience the influx of people who will be seeking employment during construction phase, therefore, SEA will be a critical aspect to be monitored.	- Develop and implement and SEA action plan with an accountability and Response Framework as part of the C-ESMP. The SEA action plan will follow guidance on the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018).
Gender-based violence GBV constitutes acts of gross misconduct and are therefore grounds for sanctions, penalties and/or termination of employment. This impact refers to gender-based violence at the community level that women and girls may experience as a result of Project implementation.	- Develop and implement provisions that ensure that gender-based violence at the community level is not triggered by the Project, including: ✓ effective and on-going community engagement and consultation, particularly with women and girls; ✓ review of specific project components that are known to heighten GBV risk at the community level, e.g. employment schemes for women; delivery of supplies; etc. ✓ Specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to employment; supply services; etc - Ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation.
Violation of children rights by contractor and child labour on site Violence against Children (VAW) is defined as physical, sexual, emotional and/or psychological harm, neglect or negligent treatment of minor children (i.e. under the age of 18), including exposure to such	- Develop and implement a Children Protection Strategy that will ensures minors are protected against negative impacts associated by the Project. - All staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behavior

Environmental and social impacts	Mitigation Measures
harm, that results in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power. This includes using children for profit, labor, sexual gratification, or some other personal or financial advantage.	- Children under the age of 18 years shall not be hired on site as provided by Child Rights Act (Amendment Bill) 2014.
Spread of HIV/AIDS, STIs and other communicable diseases The project will bring together groups of people, such as workers, community members, or visitors, which can lead to increased social interactions and mobility, contributing to the spread of HIV/AIDS and STIs. Economic development may also encourage behaviors associated with higher risk, such as multiple sexual partnerships. Migrant workers could introduce new infections or increase the transmission rates of existing diseases, while women and young girls may be more vulnerable due to gender inequalities and transactional relationships.	- Carry out periodic HIV/AIDS awareness training for workers and the beneficiary community. - Distribution of condoms to workers and beneficiary communities, especially the CIGs. - Carryout voluntary HIV/AIDS testing for workers and community members. - If tested positive, further guidance will be offered and directed to the nearest public hospital to receive free antiretroviral (ARVs) drugs and other services. - The project team should use the services of contracted GBV/SEAH service providers to undertake community outreach activities. - Hire local workers where possible to minimize the extent of any influx. - All workers shall sign CoC/ contract that has provisions on GBV/SEAH.
Workers/ Labour Influx Impacts The project will attract an influx of workers and laborers to the area, which could lead to increased pressure on local resources such as housing, water, and food supply, potentially resulting in higher costs for community members. This influx may also strain local infrastructure, including transportation and healthcare services, as the population temporarily grows.	- Ensure that locally available labour force is given priority during recruitment. Especially for casual and unskilled positions. - Providing accommodation for workers in camps if the workforce is large

11. ESMP summary and implementation arrangements

The ESMP provided in chapter 8 provides the mitigations measures of the anticipated environment and social impacts, monitoring indicators, responsible party and the cost of mitigation measures. Key impacts and risks anticipated include: waste generation, clearance of vegetation, loss of biodiversity, air pollution, occupational health and safety risks, GBV, etc. The cost for the implementation of the ESMP shall be included in the overall design, construction supervision cost of the project. Most of the environmental cost which involves engineering design is embedded in the engineering costs. However, Ksh. 1,740,000 will be spent in the implementation of the mitigation measures and environmental management administration. These costs shall also cover environmental monitoring.

The ESMP shall be provided along with bidding documents. Compliance with the ESMP shall be clearly provided for in the contract documents. The Contractor shall prepare a C-ESMP to

operationalize the ESIA findings and recommendations. Method statements will also be prepared and will be task-specific after undertaking specific risk assessments. In addition, the contractor will have a qualified fulltime EHS person to be based on site who will be responsible for the implementation of the ESMP. The contractor will be required to submit monthly progress reports on ESMP implementation during construction phase. Also, the contractor should submit incident reports, and any other as per the WB standards.

The Kisumu Water and Sewerage Company (KIWASCO) will be the implementing Agency of the project. The company has the capacity to supervise the implementation of the E&S activities. It has full time social and environmental safeguards staff that will be dedicated to the project. At the national level, WSTF will form a project implementation unit comprising of the E&S experts to oversee the project activities.

12. Conclusions and recommendations

The following are recommended with respect to the proposed Project.

(i) That strict adherence to the Environmental and Social Management Plans should be observed.

(ii) That any unforeseen impacts shall be immediately notified to the environmental assessor to ensure that they are immediately addressed and mitigated.

(iii) Project Construction works to commence after approval and issuance of the license.

(iv) The project contractor shall need to hold meetings with local communities before commencement of construction to firm up agreements of engagement.

1. INTRODUCTION

1.1. Background

The Ministry of Water, Sanitation and Irrigation (MoWS&I) is implementing Water and Sanitation Development Project (WSDP) with a credit from the International Development Association (IDA) that aims at improving water supply and sanitation services in selected regions in Kenya through the Water Service Providers (WSPs). The Project Development Objective (PDO) is to improve water supply and sanitation services in select Coastal and North Eastern regions in Kenya and improve the financial performance of Water Service Providers (WSPs) affected by the COVID-19 pandemic.

Following conclusion on allocation of grants to WSPs under the CLSG-1 program, WaterFund through the MoWS&I prepared documentation for the second phase of the CLSG program now referred to as CLSG-II program. The focus of CLSG-II is to support financial recovery of WSPs to pre-COVID levels or better. During this phase, only WSPs with potential to achieve financial recovery within a period of less than 12 months are eligible to receive the support.

A total of 31 WSPs with 77 interventions costing KES 2.198 billion have been pre-qualified to implement the CLSG II programme which is expected to start in February, 2024 for implementation period of 12 months. 18 WSPs will have significant interventions and are clustered into four groups based on their location within the county.

This ESIA report has been prepared in compliance with the Terms of Reference (TOR) for the following interventions by Kisumu Water and Sanitation Company:

i. Arina and Gudka Overhaul Works - 8018m, DN63
ii. Replacing the Milimani, Lower Railways (DN63, DN90 and DN300) and DN225 asbestos, total length is 4300m
iii. Kamaler-Guba Upgrade Works - 8400m, DN250.

1.2. Project objectives

The Project Development Objective (PDO) is to improve water supply and sanitation services and improve the financial performance of KIWASCO. The Arina and Gudka Overhaul Works will involve the complete overhaul of 8018 meters of water supply pipelines in these areas, targeting improved reliability and efficiency by reducing physical water losses due to leaks and bursts. The replacement of 4300 meters of asbestos and other pipelines (DN63, DN90, DN300, and DN225) in Milimani and Lower Railways areas will reduce health risks associated with asbestos, improve water quality, and decrease instances of pipeline bursts and leaks. Kamaler-Guba Upgrade Works will upgrade 8400 meters of water supply pipelines to DN250 specifications, resulting in increased water pressure and flow rates for a more consistent and reliable water supply.

1.3. Objective of ESIA study

The principal objective of the study is to identify the potential positive and negative environmental & social impacts expected during the construction, operation and decommissioning phases of the proposed project with the aim of proposing the possible mitigation measures. The exercise was undertaken to ensure that current and future activities does not negatively impact the environment & social fabric of the project area including human health and safety, physical (land, water, plants, and animals) components and intricate relation between them. In case any of such impacts are inevitable, a mitigation plan for the same is proposed in the study. Thus, the subject environmental and social impact assessment study formulates environmental and social considerations in the planning, designing, implementation and decommissioning phases, so as to ensure sustainable development. The present study has been undertaken in line with Kenyan legislations as well as World Bank Guidelines. In this context, Environmental Social Impact Assessment (ESIA) Study of the proposed project is performed.

In brief, the specific objectives in carrying out the ESIA are as under:

i. To discuss elements of the proposed project and policy & regulatory frameworks relevant to project

ii. Establish the social, economic and cultural make-up of the project area.

iii. Document the views of the community and other stakeholders in the project area.

iv. To identify elements of environment likely to be affected by the project and/or likely to cause adverse impacts to the project including natural and man-made environment.

v. Identify the potential social risks and how to mitigate them in the project area.

vi. To identify any potential losses or damage to flora, fauna and natural habitats.

vii. To identify the negative impacts and propose the provision of infrastructure or mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the project.

viii. To specify environmental monitoring and audit requirements, if necessary, to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.

ix. Prepare an environmental impact assessment study report compliant with the Environmental management and Coordination Act (1999) and detailing findings and recommendations.

1.4. Scope of this Report

The ESIA was carried out in compliance with the Government of Kenya's Environmental Management & Co-ordination Act of 1999 and the Environmental (Impact Assessment & Audit) Regulations, June 2003, World Bank Guidelines among other relevant laws, regulations, and guidelines. To meet the objectives stated in section 1.3 above, the consultant undertook the following tasks.

i Literature review: gathering environmental and social information pertaining to the project

ii Description of the baseline environment: collecting and presenting baseline information on the environmental characteristics of project and surrounding areas, e.g., climate, soils, geology, vegetation, fauna, valued environmental components, land use, human populations, socio-economics activities, cultural heritage, water supply and sanitation.
iii Detailed description of the proposed project: describing the proposed project, its geographic location, ecological, general layout of facilities including maps at appropriate scale where necessary
iv Legislative and Regulatory Framework: identifying and describing all pertinent regulations and standards governing environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues including compliance issues.
v Identification of potential Impacts: Analysis and description of all significant changes expected due to the proposed project
vi Occupational Health and Safety Concerns: Analysis and description of all occupational health and safety concerns likely to arise as a result of the construction of the proposed project
vii Public Participation: Consultations with the public on the positive and negative impacts of the proposed project
viii Mitigation Measures: Proposing feasible mitigation measures for the negative impacts that could result from the proposed project.
ix Environmental Management Plan: Developing an Environmental Management Plan to mitigate negative impacts:
x Monitoring Plan: Developing an Environmental Monitoring Plan
xi ESIA Report: Preparation and submission of an Environmental and Social Impact Report.

1.5. Methodology

In order to meet the study objectives, the first step was for the consultant to undertake desk study and preliminary site visit. Based on the site visit various considerations relevant to project that could influence the Environmental and Social Impact Assessment were identified. The stepwise activities as well as methodologies followed for this study is described below:

1.5.1. Desk Study

Various relevant documents were reviewed for a clear understanding of the terms of reference, environmental status of the project area, data on demographic trends, land use practices in the affected areas, development strategies and plans (local and national) as well as the policy, legal and institutional documents.

The team reviewed relevant literature including but not limited to the following reports:

- Design Report; to understand the project background, the preliminary designs and the implementation plan
- Secondary data through literature reviews to collect baseline information in the project area

- Relevant Legal, Policy and Regulatory documents with special emphasis to requirements under the EMCA, 1999, and the Environmental Impact Assessment and Audit Regulations, 2003
- World Bank's Environmental Health and Safety (EHS) Guidelines.

1.5.2. Understanding the project

The first step in environmental assessment of the proposed project was to understand the proposed site based on maps and, also analysing the direct and indirect environmental impacts, which are key in determining the scope and depth of the study.

1.5.3. Site Survey and Baseline Data Collection

Physical project site inspections and observations constituted the main baseline survey activities. The team visited site inspecting the site characteristics to assess the existing baseline condition with respect to physical, biological and socio-economic environment.

1.5.4. Physical environment

The baseline data collection methodology applied for physical environment involved a combination of primary and secondary data collection methods ranging from direct observations & visual analysis to interaction with locals during field survey on various parameters such as land use & topography, water channels, natural drainage, flood flows, climate, air, and noise quality etc.

1.5.5. Physical Cultural Resources

Archaeological and Cultural Heritage Impact Assessment has been undertaken to identify and ensure the protection of archaeological and cultural heritage assets associated with the project sites to ensure that effective management and mitigation controls are in place. The assessment included a desktop review of any available documents and records associated with archaeological and cultural heritage resources within the project sites as well as field survey of project site.

1.5.6. Biodiversity Assessment

Both qualitative (desk-stop literature review) and quantitative (field sampling) methods were employed to assess biodiversity of the study area.

The general biodiversity information gathered includes the following.

- Detailed lists of flora and fauna species (mammals, avifauna, reptiles and amphibians, fish and invertebrates) occurring in the project area.
- Fauna and flora Species of Conservation Concern (SCC) were identified based on the IUCN Red List of species i.e. Critically Endangered, Endangered, Vulnerable or Near Threatened.
- Other biodiversity value characterization criteria such as nationally threatened, nationally protected, restricted-range and endemic species, congregatory, migratory species as well as invasive species were also applied.

- Characterization of vegetation structure and habitat types i.e. modified, natural, critical

1.5.7. Data Evaluation and Analysis

Environmental assessment was carried out to identify potential impacts of the project on the environment, biodiversity and the community. The assessment was carried out in three main steps, as follows:

- Prediction of potential impacts
- Execution of specialized ecological studies on biodiversity and evaluation and assessment of the impacts in terms of their significance
- Identification/ proposing mitigation measures for minimizing the effects of the significant impacts.

After exclusion of the negligible impacts, the remaining aspects were assessed based on the following criteria:

- Magnitude of the impact.
- Duration: period that impact lasts.
- Mitigation measures: its availability whether integrated in the project design or implemented as management measures; and
- Residual impacts.

Where negative environmental impacts are expected, the majority of them will be experienced during the construction phase. To help manage the potential negative impacts, mitigation measures are suggested, and the residual impact evaluated.

1.5.8. Public Consultations.

Public consultations were undertaken in August 2024 during the environment and social impact assessment study to document the social impacts to the project area and general community perceptions on the project. In general, the following steps were followed in carrying out the entire consultation and public participation process: -

- Identification of institutions and individuals interested in the process and compiling a database of the interested and affected parties
- Administration of questionnaires to different target groups and local community members within the proposed project site.

One-on-one interviews with government agencies (KeNHA, KeRRA, KURA, WRA) and other institutions in the project area were undertaken to assist in analysis of impacts to the community and institutions in the project area. These interviews were conducted to augment and confirm data and information obtained using the other tools and methodologies i.e. Community meetings and public consultations.

2. PROJECT DESCRIPTION

2.1. Geographic, ecological, general layout

2.1.1. Milimani DN350mm & DN 250mm Distribution Water Main Overhauls

The project site is in Kisumu City, Western Kenya. The overhaul targets two main pipelines that run from Dunga Water Treatment Works, supplying water to the Milimani, Nyalenda, Nyamasaria neighbourhoods, and the Central Business District (CBD) of Kisumu. The pipelines pass through both urban and suburban areas, with key stakeholders, including hotels, clinics, and state properties.

Kisumu is located near Lake Victoria, and the project must consider ecological sensitivities, particularly concerning water conservation. The environment is a mix of urban infrastructure, parks, and commercial properties. Special attention must be paid to the protection of green spaces like Impala Park and Oile Park.

The DN350mm pipeline runs through areas such as Milimani, Nyalenda, and Nyamasaria, while the DN250mm pipeline runs through the CBD along major roads such as Achieng Oneko Road, Kakamega Highway, and Jomo Kenyatta Highway. The layout requires careful planning due to the road crossings, commercial properties, and complex underground infrastructure.

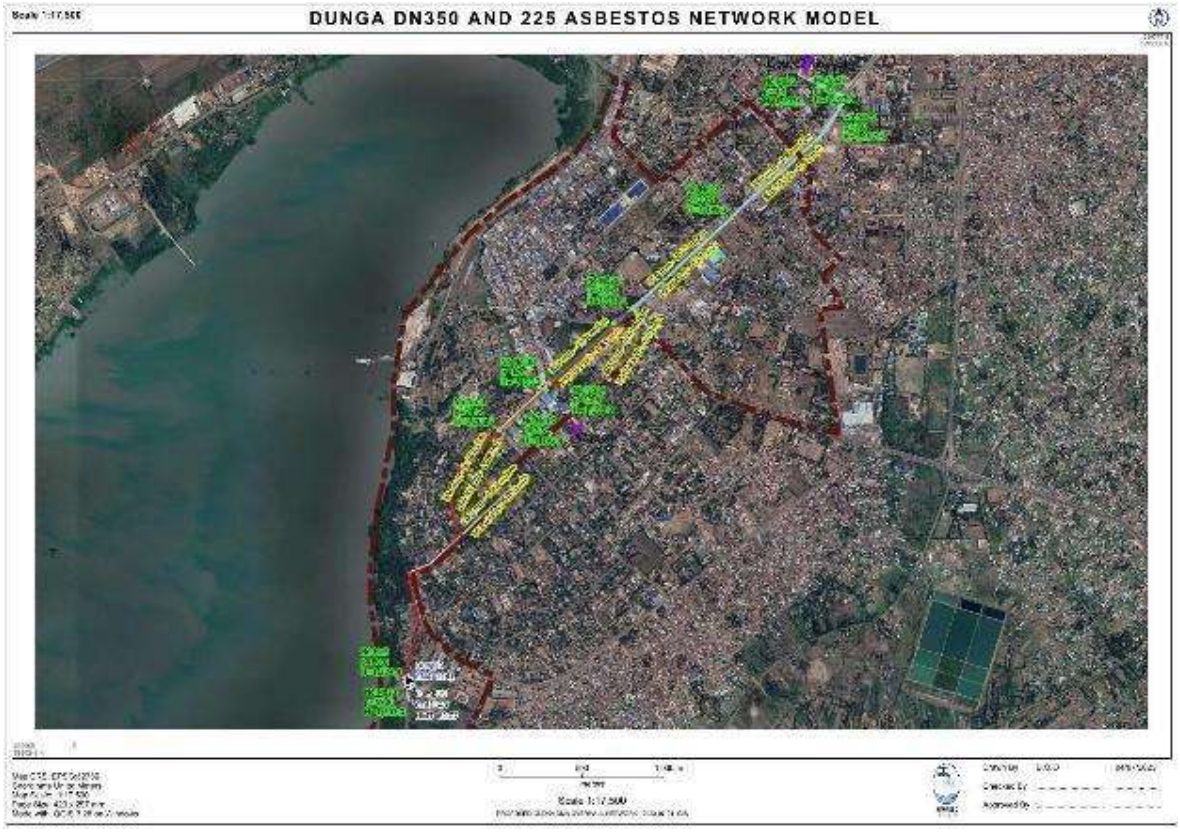


Figure 2-1: *Google Earth showing location of Milimani proposed potable water networks overhaul*

2.1.2. Arina, Gudka & Lower Railways Estates Overhaul works

The Arina, Gudka & Lower Railways Estates Overhauls is a water supply infrastructure project aimed at improving water distribution in the Arina Estate, Gudka Estate, and Lower Railways areas. These areas have been experiencing issues with water supply, primarily due to old, inefficient piping systems, and inaccessibility of existing pipelines. The project involves the installation of new PVC pipes, reorganization of existing lines, and ensuring that all households are adequately connected to the water supply network.

Arina Estate

Arina Estate is in Kisumu County, adjacent to key landmarks such as the Police Dog Unit Junction along Kisumu-Kakamega Highway, Arina Primary School, and a church. The estate is primarily residential, with approximately 560 households. The topography of the area supports a gravity-based water supply system, utilizing the natural slope of the land to facilitate water flow.

Arina Estate is characterized by residential zones interspersed with educational and religious institutions. The area is relatively flat with some greenery, and the soil composition supports hand-driven excavation for pipe installation. However, the presence of old galvanized iron (GI) pipes, which are buried and inaccessible due to resettlement and urban development, poses a challenge to the overhaul process.

The current water supply system in Arina Estate relies on two primary reservoirs:

1. **Reservoir 1** - Located at the Police Dog Unit Junction along the Kisumu-Kakamega Highway.
2. **Reservoir 2** - Positioned along the Nyamasaria-Kondele Bypass.

The existing lines run between houses, causing accessibility challenges and frequent water supply disruptions. The new design proposes relocating the pipelines along the main roads within the estate to allow easier access for maintenance and repairs. This will involve the installation of:

- **4-inch main lines** along the estate roads.
- **2-inch sub-feeder lines** for distribution to individual households.

The estate is also equipped with fire hydrants, which will be incorporated into the new layout to ensure continued fire safety provisions.

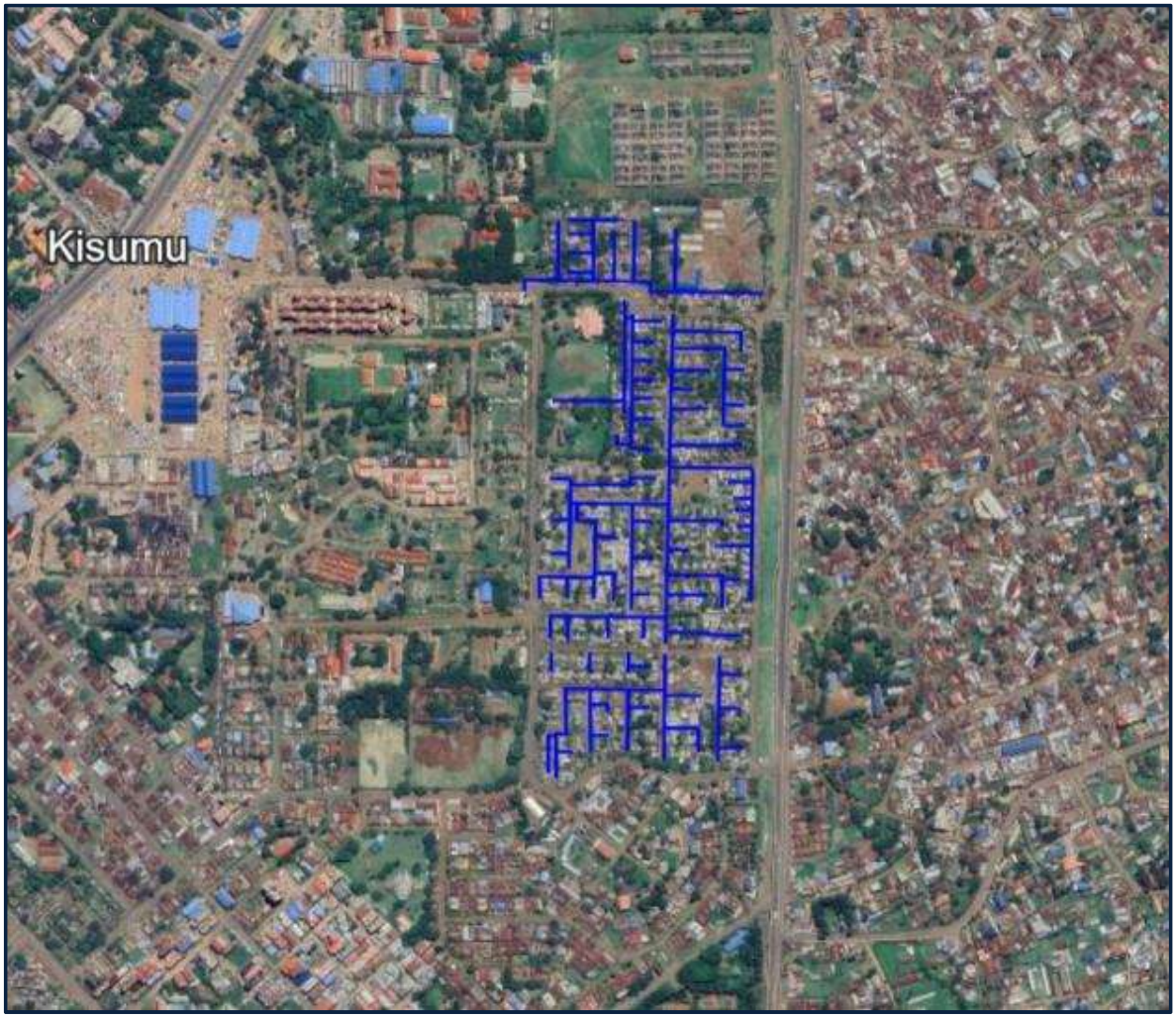


Figure 2-2: *Google Earth showing location of Arina proposed potable water networks overhaul*



Figure 2-3: *Proposed pipeline crossing in front of Arina Primary and Junior Secondary school gate*



Figure 2-4: *Businesses along Arina proposed pipeline*



Figure 2-5: *Route of Arina proposed water networks overhaul*

Gudka Estate:

Gudka Estate is a densely populated residential area located along the Carwash-Sije Road. The estate comprises 160 households and is serviced by a gravity-fed water supply system. The terrain is slightly sloped, supporting the gravity system from a reservoir modelled at the offtake point along Carwash-Sije Road, based on the measured pressure.

The area is characterized by tightly packed houses, with limited space for infrastructure development. Ecologically, the estate is urban, with minimal green space. The soil is mixed, supporting both excavation and pipe installation.

The current water supply lines in Gudka Estate run between the houses, making them difficult to access for maintenance and prone to damage. The proposal for the estate includes:

- Installation of new **low-class PVC pipes** to replace the old, deteriorating lines.
- Relocation of water lines along accessible routes such as estate roads, where they can be easily maintained.

The existing lines will be overhauled entirely, with a focus on improving the overall efficiency of water distribution to the households.



Figure 2-6: *Google Earth showing location of Gudka proposed water networks overhaul*

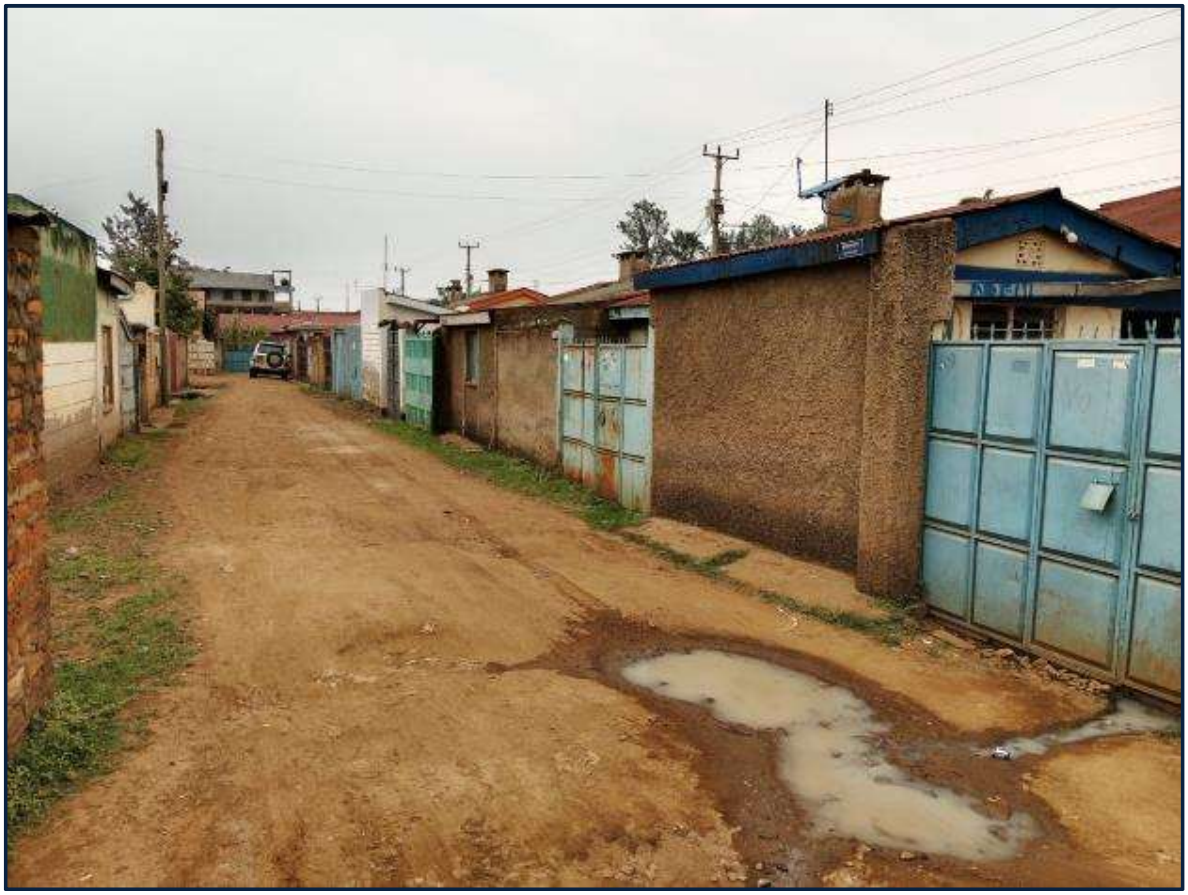


Figure 2-7*: Route of Gudka proposed water networks overhaul*

Lower Railways:

Lower Railways is an urban area located behind the Kenya Power and Lighting Company (KPLC) offices along Bank Street. The area is characterized by a mix of commercial and residential buildings, with a gravity-fed water supply system originating from a reservoir at an offtake point behind KPLC, modelled from a DN 150 pipeline. The area has AC pipes which will be overhauled but will be left buried.

The area is urban, with minimal vegetation and a high density of infrastructure. The Estate is gently sloppy as it extends toward the lake, making it ideal for gravity-based water distribution.

The water supply system in Lower Railways relies on a gravity-fed reservoir that serves both residential and commercial buildings. The current infrastructure includes older pipelines that are inefficient and prone to leaks.

The proposed overhaul involves:

- Upgrading the main distribution lines to ensure consistent water supply.
- Installing new lines along accessible routes for easier maintenance.



Figure 2-8: *Google Earth showing location of Lower railways proposed water networks overhaul*



Figure 2-9: *The line passes along the fence below the power distribution line along the tarmac road then it enters the estate*

2.1.3. Kamaler-Guba Upgrade Works - 8400m, DN250:

The area of interest lies in Kisumu East Constituency. It traverses through Wathorego sub location. The Offtake location is at Kaura from 600mm epoxy-coated steel Kajulu gravity main. The villages where the proposed network is expected to transverse is from Kaburon, Kamoke B and A, Kanyumba C, Alango, Kotunga and Kamenya Gari. It has the following spatial extents; between latitude 0° 2'8.74"South and 0° 4'10.93"South and Longitude 34°47'44.54" East and 34°49'24.24" East. The area is gently sloping with the highest elevation at 1216m while reducing gradually southwards to a low of 1179m. The settlement pattern in the area is generally along the main road where the water network is supposed to pass. There is considerable economic activity at Guba and Wathorego market centres. The community also practices small scale agricultural farming with livestock rearing albeit in small numbers. The area has other considerable institutions and industries that offer employment to the community and would equally require a dedicated water supply. This include Kibos Sugar, Kibos Paper Plant, Kibos Prison, Kibos Refinery, and Kibos correctional facility. The project area has two dispensaries that serve the population with on located at Kotunga and the other at Kibos.

The offtake point at Kaura from DN 600 was modelled as a Reservoir based on the Static Head from Kajulu Intake.

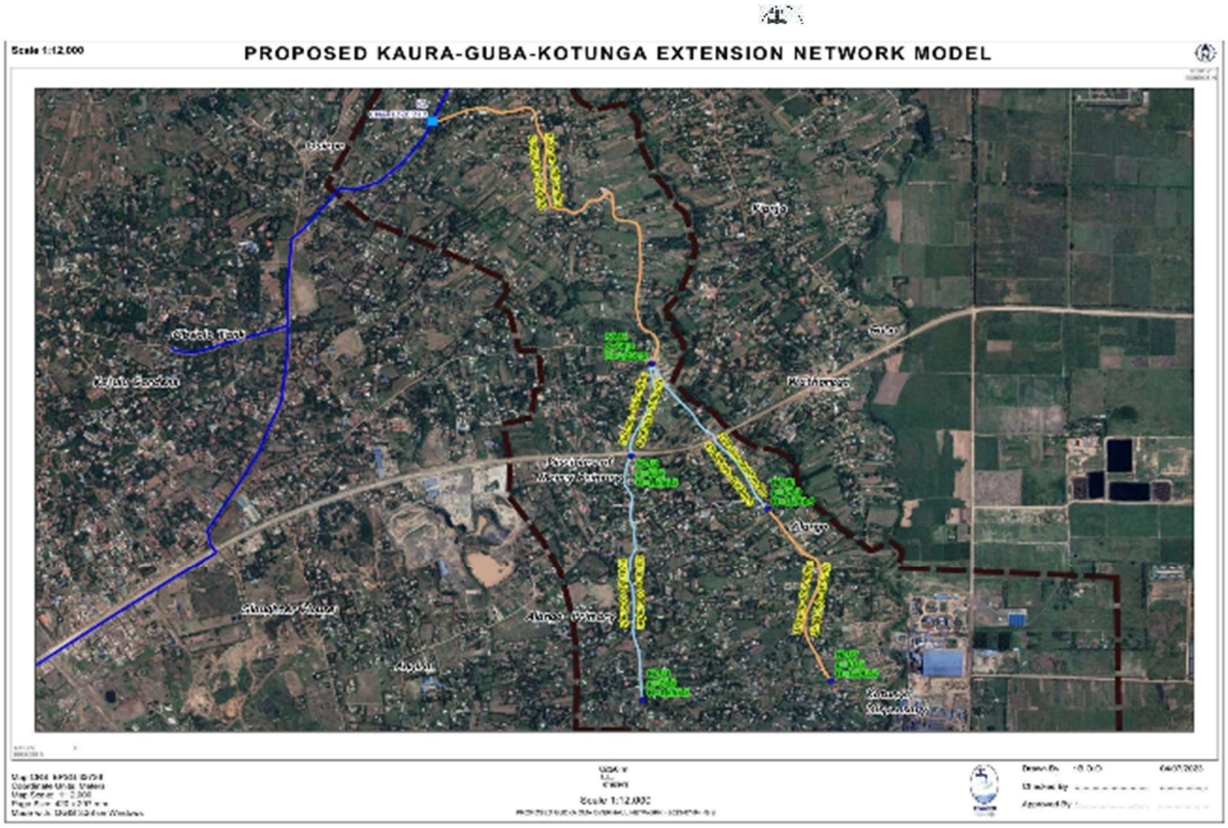


Figure 2-10: *Google Earth showing location of proposed water networks*

Javic Junior School is a notable educational institution within the project area, located near a drainage culvert. This school serves as a key community facility for local children.



Figure 2-11: *Javic Junior school along the proposed water pipeline*

2.2. Land required and its availability

The project will use existing easements to minimize the need for additional land acquisition. The 14-inch pipeline route primarily utilizes existing road reserves along Harambee Road, Adala Otuko Road, and Achieng Oneko Road, minimizing the need for land acquisition. The route passes through urban areas, including significant landmarks like Kisumu Impala Park Sanctuary, Parkview Hotel & Apartments, and Kisumu State House. The use of road reserves means that the land is publicly owned and readily available for the project. However, special considerations may be needed when working along the road adjacent to the sensitive areas like Kisumu Impala Park Sanctuary, requiring coordination with environmental authorities. The impala park sanctuary was consulted during field visit.

The 9-inch pipeline route also will be on road reserves along Okore Road, Achieng Oneko Road, and through busy commercial zones near Postbank, Naivas Supermarket, and Kisumu Boys Roundabout. This route, being situated in urban areas with heavy traffic and commercial activity, will require careful planning to avoid disruptions. Since the land required is primarily a long road reserves, it is publicly accessible, reducing the need for additional acquisition. However, coordination with businesses and local authorities will be necessary to ensure smooth project execution.

The Kaura-Guba-Kotunga Water Supply Network Extension Project design also leverages existing roads and other rights-of-way to reduce the need for additional land acquisition. By following established infrastructure corridors, the project minimizes its impact on residential, agricultural, and commercial land. The area along the route includes several economic hubs, such as Guba and Wathorego market centers, as well as small-scale agricultural activities and livestock rearing. Given that the pipeline is intended to follow existing easements, there will be no additional land required.

The current networks within Arina, Gudka, and Lower Railways estates will be laid along the same or nearby corridors to limit disruption. Additional land will not be required.

2.3. Intervention design and construction processes

2.3.1. Intervention Design

Key Components of the Design:

- **Water demand Analysis**: Population projections for the respective service areas are based on census data and geometric growth rates to estimate future water demand.
    - For the Kaura-Guba-Kotunga water supply network extension project, a population of 15,919 is projected as the ultimate design population for the service area within Kisumu East Constituency. This population estimate is based on a 2.7% growth rate projection from the 2019 census data, targeting the year 2043. The estimated water consumption for this population is set at 100 liters per capita per day, which reflects the area's classification as a rural area with high potential. This results in a domestic water demand of approximately 1,910 cubic meters per day (or 22.11 liters per second). The

demand calculation also includes a non-revenue water (NRW) factor of 20%, which accounts for water losses during distribution. In addition to the domestic demand, institutional water demand from local facilities, including Kibos Sugar Company, Kibos Prison, and several schools and dispensaries, contributes an additional 4,797 cubic meters per day (or 55.52 liters per second). This brings the total water demand for the project area to approximately 6,707 cubic meters per day (or 77.63 liters per second).

- For the proposed DN350mm & DN250mm water pipeline overhaul, a population of 2,717 accounts is projected, which includes significant consumers within the Central Business District (CBD). With an average water consumption of 192,309.24 cubic meters per month, this translates to approximately 6,410 cubic meters per day. Based on the design demand, this results in an estimated water consumption rate of approximately 74.19 liters per second, or 267 cubic meters per hour, ensuring a steady and adequate water supply for the region's needs.

- For Gudka Estate, a population of 1,044 is projected, with an estimated water consumption of 150 liters per capita per day, resulting in a total demand of 156,600 liters per day (156.6 cubic meters per day), which equates to approximately 6.525 cubic meters per hour or 1.813 liters per second.

- For Lower Railways, a population of 804 is projected, with an estimated water consumption of 150 liters per capita per day, resulting in a total demand of 120,600 liters per day (120.6 cubic meters per day), which equates to approximately 5.025 cubic meters per hour or 1.396 liters per second.

- For Arina, a population of 3,144 is projected, with an estimated water consumption of 150 liters per capita per day, resulting in a total demand of 471,600 liters per day (471.6 cubic meters per day), which equates to approximately 19.65 cubic meters per hour or 5.46 liters per second.

- **Hydraulic Modelling and Pipe Sizing**: The hydraulic designs utilize the Darcy-Weisbach formula for calculating frictional head losses in the network.

  - For the Kaura-Guba-Kotunga network, a gravity-fed system from the Kaura offtake point is used, with pipe diameters selected based on the most optimal head loss and discharge combinations. DN250, 160, and 110mm pipes were chosen for different sections of the network.

  - The Arina, Gudka, and Lower Railways estates utilize gravity systems as well, with reservoir head models and pressure regulation to ensure consistent supply. Pipe diameters of DN110, 90, 63, and 50mm were chosen for these areas to balance head loss and supply pressure.

  - The DN350mm and DN250mm mains overhaul will improve the capacity of the primary distribution network, reducing interruptions and accommodating future growth.

- **Leak Detection and NRW Management**: The intervention design incorporates enhanced leak detection and management systems to tackle the high levels of NRW experienced in the project areas. The use of GIS-based monitoring and pressure regulation ensures timely identification of leaks and bursts, reducing water loss and improving service efficiency.

2.3.2. Construction Process

The construction process will be executed in phases to ensure minimal disruption to the communities and institutions served by KIWASCO. The following steps outline the key activities involved:

Phase 1: Site Clearance, Excavation and Foundation Works and back filling

The development shall involve site clearance and excavation works for installation of pipes and construction works. The development will stick to public land and the existing system as much as possible. Excavation and other related project works will be labour based with use of hand tools unless otherwise required, heavy earthmoving machinery such as tractors and bulldozers will be used at a minimum. This will be done to minimise destruction of properties. The pipes will be backfilled well after laying.

Phase 2: Masonry, Concrete Work and Related Activities

The overhaul works and installation of water networks will require masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, and curing of fresh concrete surfaces especially on the manholes or inspection chambers. These activities will be labour based but will be supplemented by machinery such as concrete mixers where necessary though the proponent anticipates it to be entirely labour based.

Phase 3: Plumbing

The plumbing activities will be carried out by the project contractor under the supervision of an appointed Project Engineer. Plumbing activities will include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others. Majority of the pipe works will use HDPE pipes thus butt fusion machines will be used.

Phase 4: Landscaping

To improve the aesthetic value or visual quality of the area the proponent, will develop tree nurseries consisting of indigenous species to provide seedlings for rehabilitation of project affected areas by community members in collaboration with the Kenya Forests Service and NEMA.

Phase 5: The Operational Phase

Water management is a broad term that encompasses the regulation, control, use, conservation and harvesting of water for domestic use or agriculture. It also refers to efficient or economical management of available water in agriculture and use of surface and subsurface water resources in agricultural production. A major challenge in water harvesting for irrigation, domestic and livestock use is the need for proper operation and maintenance, as most of the structures are community owned. When the local land users are not fully involved from the start, operation and maintenance is a big problem.

Operation phase of the project will include supplying water to the area residents by gravity. Upon completion of the project, the project will be managed by KIWASCO. The water company will distribute the water to their customers and bill them at the end of the month.

Phase 6: General Repairs Maintenance of Water Supply

Maintenance of the water supply infrastructure requires to be conducted periodically to ensure sustainability of the project. The water supply line requires frequent check on blocks, burst, illegal connections, and evaluation of the general working condition of the project components from abstraction point to end users.

The proponent technical team shall conduct monitoring of the water supply line to ensure they are maintained in the required standard. The community members have been advised to be vigilant to reduce chances of vandalism.

Phase 7: Water Quality Monitoring

It is advisable to conduct continuous monitoring of the water quality and quantity in order to capture any disturbance in the system. Monitoring should be conducted through development of gauging and standard measurement systems which shall be compared to develop baseline information and existing guidelines or standards.

Phase 8: Decommissioning Phase

Upon decommissioning, the project components will be demolished and pipe uninstalled. This will produce a lot of solid waste, which are advisable to be reused for other construction works or if not reusable should be disposed of appropriately by a licensed waste handling company. All equipment including installations, pipework among others should be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse equipment in other projects. This will be achieved through resale of the equipment to other developers or contractors or donation of this equipment to schools, churches and charitable institutions. The contractors camp can also be donated to the water company to us as offices or store for pipes.

Once all the waste resulting from demolition and dismantling works is removed from the site, the site should be restored through replenishment of the topsoil and re-vegetation using indigenous plants and grass.

2.4. Natural resources (water and construction materials)

2.4.1. Water Requirement

The installation and operation activities of the proposed water networks will require high quantity of water. Water is a crucial resource for both the construction processes and the eventual water supply network operation. Water will be sourced from existing local water networks managed by KIWASCO.

Kaura-Guba-Kotunga Water Supply Network Extension: The estimated daily water demand for the Kaura-Guba-Kotunga network is 6,707 cubic meters per day, including domestic and institutional consumption. The water source for this project is the 600mm epoxy-coated steel Kajulu gravity main, which will feed the new network. Construction activities such as trench excavation, concrete mixing, and dust suppression will require approximately 100 cubic meters of water per day over the duration of the construction period.

Arina, Gudka & Lower Railways Estates Overhauls: The combined water demand for Arina, Gudka, and Lower Railways estates is estimated at 754 cubic meters per day. Water usage during construction will be approximately 50 cubic meters per day for trenching, cleaning, and testing the new pipes.

DN350mm & DN250mm Distribution Water Main Overhauls: The total water demand served by the overhauled network is projected at 5,000 cubic meters per day. About 70 cubic meters of water will be required per day for pipe installation, site cleaning, and system testing.

2.4.2. Construction Materials Requirements

Several machines will be required for successful operation of the proposed project. Although hand tools will be increasingly used during construction of the pipeline, some sections e.g. the main pipeline will require minimal use of machinery. The number of equipment and machineries to be used will be confirmed at the start of construction works. Where destruction or interruption of business is realized use of machines will be avoided. The Table below gives a summary of equipment, and machines required for successful implementation of the project.

Table 1: Project equipment and facilities requirements

S. No	Equipment/ Facility	Purpose
1	Hand tools including jembes, Spades and mattocks	For use in the excavation of trenches
3	Excavators	Excavation works.
4	Loaders	For mobilization of excavator to site
5	Tippers	For transportation of materials from the material sources to the project site
6	Mixers	For mixing mortar
7	Rollers	For compacting surfaces
8	Pick-up truck	For transportation of personnel to site
10	Drilling machines	For rock drilling
11	Butt fusion machine	For jointing of HDPE pipes
12	Portable toilet	For use by construction workers.

2.5. Labour requirements

Several personnel will be required at the project site to carry out various activities and functions associated with implementation of the proposed project. They include among others professional staff, operators, drillers, drivers and labourers. The number of personnel to be involved in the Works will however be determined at the commencement of project construction. The Table below gives a summary of personnel requirements for the proposed project. It is recommended that priority is given to the residents of Kisumu when recruiting the personnel.

Table 2: Labour requirements for project operations

No	Trade	Responsibility
1	Inspectors of works	Overseeing the site operations and work instructions

No	Trade	Responsibility
2	Health and Safety Officer	Supervision of implementation of health and safety requirements during project implementation
3	Environmentalist	Supervision of implementation of environmental requirements during project implementation
4	Sociologist	Dealing with community liaison and grievances arising in the course of project implementation
5	Welders	In charge of welding works within construction sites
6	Laborers	In charge of unskilled labour within construction sites
7	Drivers	In charge of driving vehicles and equipment used in construction sites
8	Plumbers	In charge of plumbing works within construction sites
9	Masons	In charge of masonry works
10	Mixer driver	In charge of driving mixers within the construction sites
11	Excavator operator	In charge of operation of excavators within construction sites
12	Surveyors	In charge of survey and positioning of works
13	Truck drivers	In charge of driving Trucks within the construction sites
14	Security Officer	In charge of site security

2.6. Waste generated

2.6.1. Excavated Material

During the excavation phase of the water pipeline project, the handling and management of excavated material are critical. The types of excavated material expected to be generated include soil, rock, and other earth materials that are removed to create trenches for pipeline installation. This material must be carefully managed to avoid environmental contamination and to ensure it does not affect surrounding areas. Proper techniques for stockpiling and disposal are essential, including using designated storage sites and implementing erosion control measures. Additionally, strategies should be in place for reusing or recycling excavated material where possible, which can help reduce the environmental footprint of the project.

2.6.2. Old Pipeline Materials

The old pipeline materials, which are being replaced or upgraded, pose unique challenges during the decommissioning process. The expected waste in this category includes outdated or degraded pipes that no longer meet current standards. The removal and disposal of these old pipes will be generated in significant quantities and must be carried out with caution to prevent environmental hazards and ensure that all safety protocols are followed. Proper procedures for the handling, transportation, and disposal of these materials are required to mitigate potential risks. KIWASCO proposed to leave the asbestos pipes undisturbed and buried underground once the new lines are commissioned.

2.6.3. Residual Water and Sediment

Residual water and sediment from the construction process can impact both the environment and the efficiency of the project. Expected residual water will be generated in trenches or

excavations and could potentially lead to issues such as soil erosion or contamination. Effective management of residual water includes measures such as dewatering techniques and proper drainage systems to prevent water accumulation. Sediment control is equally important to ensure that sediment does not enter water bodies or cause further environmental issues. Implementing sediment traps, silt fences, and other best practices can help manage sediment and minimize its impact.

2.6.4. Construction Waste

Construction waste generated during the project will include materials such as broken pipes, packaging, and excess building supplies. Proper management of construction waste involves segregation, recycling, and disposal according to relevant regulations and best practices. Establishing a waste management plan that outlines how different types of waste will be handled, including the use of recycling facilities and waste diversion strategies, can help reduce the amount of waste sent to landfills. Ensuring that all construction waste is dealt with efficiently and responsibly contributes to the overall sustainability of the project.

2.6.5. General Waste

General waste produced during the pipeline construction process encompasses everyday waste materials such as food wrappers, bottles, and other non-hazardous items. This type of waste will be generated continuously and should be managed through regular collection and proper disposal practices to prevent accumulation and potential environmental harm. Implementing waste reduction strategies, such as using reusable containers and reducing packaging, can also help minimize the amount of general waste generated. Ensuring that general waste is separated from other types of waste can facilitate more efficient recycling and disposal processes.

2.6.6. Corroded Metal Pipes

Corroded metal pipes are a significant concern when dealing with old infrastructure. These pipes, often compromised by rust and corrosion, will be generated in substantial quantities and require careful handling during removal to prevent the release of potentially hazardous materials. The disposal of corroded metal pipes must be managed in accordance with environmental regulations, which may involve special treatment or recycling processes to mitigate any negative impact. Assessing the condition of these pipes and employing appropriate safety measures during their removal and disposal is crucial to maintaining environmental and public health standards.

2.6.7. Pipeline Coating and Insulation Materials

Pipeline coating and insulation materials are integral to maintaining the functionality and longevity of the pipelines. During the construction or decommissioning phases, managing these materials involves addressing any potential environmental concerns associated with their removal and disposal. The expected waste from pipeline coatings and insulation materials will include materials that may contain chemicals or other substances requiring careful handling to avoid contamination. Proper disposal methods should be employed, including adhering to regulations for hazardous materials if applicable. Additionally, considering the use of environmentally friendly materials for new pipelines can help reduce the impact of these substances on the environment.

2.7. Applicable permitting process

A legal register listing all legislation, legal instruments relevant to the site has been prepared, indicating applicability to the site. In addition, permits and licenses that are required to be obtained by the project during construction and operation has been provided.

No.	Licenses/Permits	Legislation
1.	ESIA License for project	EMCA 1999
2.	Water extraction permit from water resource authority	Water Act 2016
3.	Workplace Registration License from DOSHS	OSHA 2007
4.	NEMA License to transport waste	EMCA 1999
5.	NEMA Noise Vibration Permit	EMCA 1999
6.	Business/Trade license	County Government of Kisumu

x

2.8. Project cost

The total project cost for the installation of the bulk meters and associated accessories is Kenya shillings One seventy-six Million Three hundred and fifty one Thousand nine hundred and ninety three (Ksh. 176,351,993). The EIA processing fee payable to NEMA is 0.1% of the project cost which translates to KSh. 176,351.

(See appendix F: BoQ)

3. LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

Regulation 18 (1) (b) of the Environmental (Impact Assessment and Audit Regulations) 2003 require an environmental assessment study report to, among others; include a concise description of national environmental legislative and regulatory framework. This chapter presents a review of the current policy, legal and regulatory framework applicable to environmental management of the proposed water networks, both at local and international levels.

3.1. Applicable County Laws

NO	POLICY	RELEVANCE	APPLICABILITY TO THE PROJECT
1	Kisumu County Climate Change Policy, 2019	The policy aims to ensure water security in the face of climate change, promoting economic growth and resilience to extreme events like floods and droughts	The project will adhere to this policy by providing a reliable water supply, ensuring equitable access to water, and incorporating climate resilience measures in its design. It will also encourage investment through economic incentives and mitigate risks associated with extreme weather events.
2	Kisumu County Environment Policy, 2019	The relevant objective is to provide a framework for an integrated approach to planning and sustainable management of the environment and natural resources, especially aquatic ecosystems, to promote economic growth and improve livelihoods.	The proposed water pipeline contributes towards achievement of this policy through ensuring the sustainable management of water resources. By integrating this infrastructure, the project aligns with the policy's goal of bettering quality of life and supports its objective of strengthening governance and effective management of environmental resources.
3	Kisumu County Public Participation Act, 2015	The Act emphasizes the need for community consultation and involvement in decision-making processes to ensure that the needs and interests of all stakeholders are considered, fostering sustainable decisions and aligning with national governance principles.	The proposed water pipeline contributes towards the achievement of this policy through active engagement with local communities and stakeholders. This includes consulting them on the project, ensuring their inputs are considered, and providing equitable access to information, thereby enhancing transparency and sustainability in the project implementation.
4	Kisumu County Economic and Social Council Act, 2019	The Act aims to establish a structured mechanism for high-level consultations and integrated planning, ensuring that county interests and national policies are considered. This is relevant as it supports the coordination of various stakeholders and enhances the strategic planning necessary for large-scale projects like water pipelines.	The proposed water pipeline contributes towards the achievement of this policy through providing a forum for high-level consultations and integrated planning that incorporates county interests. It will ensure effective engagement and participation of stakeholders, promoting social accountability and monitoring throughout the project.

3.2. Applicable National policies, laws and regulations

Table 3 presents a summary of relevant policies that were analysed in this ESIA.

Table 3: Policy Framework Relevant to the Water Networks Project

NO	POLICY	RELEVANCE	APPLICABILITY TO THE PROJECT
1	National Environment Policy (NEP)2013	The Policy goal is towards a better quality of life for present and future generations through sustainable management and use of theenvironment and natural resources. The objective of the policy among others is to ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods.	The proposed project will contribute to achievement of this policy's mission through provision of water after the construction of the Transmission and distribution Pipelines. This Project will lead to equitable distribution of water in Kisumu City County.
3	The National Water Policy, 2021	The water policy proposes to mitigate the challenges and threats facing the water sector by ensuring that coordination and accelerated partnerships are mainstreamed in the management and provision of water resources. It also sets the goal of enhancing protection of watersheds and other catchment areas in the country.	The Water Pipeline Project will result into sustainable utilization of scarce water resources through equitable distribution.
4	The National Environmental Sanitation and Hygiene Policy-July 2007:	The Policy is devoted to environmental sanitationand hygiene in Kenya as a major contribution to the dignity, health, welfare, social well-being and prosperity of all Kenyan residents. The Policy recognizes that healthy and hygienic behaviour and practices begin with the individual.	The proposed water pipeline contributes towards achievement of this policy through provision of sustainable water for domestic use to residents of Kisumu.
5	National Policyon WaterResources Management and Development (Sessional Paper No.1 of 1999)	The management of water resources in Kenya is guided by four specific policy objectives, among them Preserve, conserve, and protect available water resources and allocate it in a sustainable rational and economic way.	The proposed water networks project will result into sustainableutilization of scarce water resources through equitable distribution
6	Kenya Vision 2030	The Kenya Vision 2030 is the current National Development blueprint for period 2008 to 2030. The vision has three pillars; economic, social andpolitical. It is recognized that Kenya is a water scarce Country but stated (Kenya, 2007: 115) thatthe Vision for the water and sanitation sector is "to ensure water and improved sanitation services availability.	The Project will directly contribute towards achievement of objectives of vision under the environment and social pillar through provision / improvement of water infrastructure
7	National Climate Change Response Strategy, 2010	The strategy paper recognizes that Kenya is a water scarce country and offers a variety of strategies for ensuring that the resource is utilized in ways that recognize that it is a finite resource. The paper also argues that interventions in the water sector should take a participatory approach involving different water users including gender groups, socio-economic groups, planners and policy makers in water resource management (Kenya, 2010: 53).	Provision of Sustainable water to residents of Kisumu is a way of ensuring community resilience to climate change impacts. The Project will ensure that water resource is utilized in ways that recognize that it is a finite resource

NO	POLICY	RELEVANCE	APPLICABILITY TO THE PROJECT
8	Climate Change Policy Framework 2016	The Policy was developed to facilitate a coordinated, coherent and effective response tothe local, National and global challenges and opportunities presented by climate change. An overarching mainstreaming approach has been adopted to ensure the integration of climate change considerations into developmentplanning, budgeting and implementation in all sectors and at all levels of government. This Policy therefore aims to enhance adaptive capacity and build resilience to climate variabilityand change, while promoting a low carbon development pathway.	The proposed water pipelines is among the projects that align to provision above especiallyin fight against poverty and food security through provision of sustainable water to residents of Kisumu.
9	Economic Recovery for Wealth and Employment Creation Strategy 2006	The overall goal of the strategy is to ensure clear improvement in the social and economic wellbeing of all Kenyans; thereby giving Kenyansa better deal in their lives, and in their struggle tobuild a modern and prosperous nation.	The key areas covered in the strategy are: Expanding and improving infrastructure and Safeguardingenvironment and natural resources among others. The proposed Project directly conforms to these provisions.
11	Kenya National Youth Policy 2006	This Policy aims at ensuring that the youth play their role alongside adults in the development of the Country. The National Youth Policy visualizes a society where youth have an equal opportunity as other citizens to realize their fullest potential.	The project will provide direct employment to the youth as required by the Policy.
12	National Gender and Development Policy, 2019	The goal of the policy is to “achieve gender equality and women’s empowerment in nationaldevelopment so as to enhance participation of women and men, boys and girls, vulnerable and marginalized groups for the attainment of sustainable development”. The policy sets, legislative and administrative measures to address the existing gaps in the realization of gender equality and women’s empowerment	The policy will be important at the time of recruiting workers during Project implementation.
13	National policy for prevention and response to gender-based violence, 2014	The overall Goal of this National Policy is to accelerate efforts towards the elimination of all forms of GBV in Kenya. The Policy Goal is to be realized as laid out in the key objectives which seek to ensure; a coordinated approach in addressing GBV and effective programming; enhanced enforcement of laws and policies towards GBV prevention and response; increase in access to quality and comprehensive support services across sectors; and improved sustainability of GBV prevention and response interventions.	Provisions of this policy will be adhered to during project implementationphase.

NO	POLICY	RELEVANCE	APPLICABILITY TO THE PROJECT
14	The National Occupational Safety and Health Policy, 2012	The main objective of this policy is to establish National occupational safety and health systems and programmes geared towards the improvement of the work environment. The Policy seeks to reduce the number of work- related accidents and diseases, and equitably provide compensation and rehabilitation to those injured at work or who contract occupational diseases. It thus requires employers to ensure safety and health at workplace, establishment of safety and health committees at workplaces, conduct training on occupational safety and health and report accidents, diseases and other dangerous occurrences to relevant authorities	The contractor will be given a copy of the ESMP to develop Contractor-ESMP for compliance during construction including provision of PPE, erection of signages at critical points, sealing the pan construction area to avoid unauthorized entry and accidents.
	Sustainable Waste Management Policy, 2021	The policy aims to promote sustainable waste management through the application of waste hierarchy and circular economy principles. It seeks to improve the efficiency of waste management processes, including mapping, planning, and transportation.	The project will incorporate sustainable waste management practices by implementing waste hierarchy and circular economy principles. This includes reducing waste generation through efficient planning and design, reusing materials where possible, and recycling construction by-products.

3.3. Legal Framework

Applicable Acts of Parliament as summarized in **Table 4** were reviewed.

Table 4: Legal Framework Relevant to Water Infrastructure

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
Constitution of Kenya (CoK) 2010	Article 43 (1) provides that every person has the right – (b) to accessible and adequate housing, to reasonable standards or sanitation; and, (d) to clean and safe water in adequate quantities. These provisions oblige state organs and bind them to provide not just high quality or clean and safe water but also adequate quantities to all people that they will serve.	The proposed project will comply with all constitutional requirement of ensuring sound management of the environment by implementing the proposed environmental and social management plan. It also calls for the duty given to the Project proponent to co-operate with State organs and other persons to protect and conserve the environment as mentioned in Part II.
EMCA 1999	The Environmental Management and Coordination Act of 1999 (EMCA) was enacted to provide an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. EMCA does not repeal the sectoral legislation but seeks to coordinate the activities of the various institutions tasked to regulate the various sectors. These institutions are referred to as Lead Agencies in EMCA. Lead Agencies are defined in Section 2 as any Government ministry, department, parastatal, and State Corporation or local authority in which any law vests functions of control or management of any element of the environment or natural resource. EMCA and its subsidiary legislations are enforced by the National Environment Management Authority (NEMA). Section 58, all projects listed in the Second Schedule of the Act must submit a study report to NEMA.	The water Project is classified under Medium-risk project in the Second Schedule of EMCA 1999, and thus requires an ESIA. By conducting this ESIA, the project therefore complies with the Act.
Land Act, 2012	It is the substantive law governing land in Kenya and provides legal regime over administration of public and private lands. It also provides for the acquisition of land for public benefit. The government has the powers under this Act to acquire land for projects, which are intended to benefit the general public. This Act provides for the procedure to be followed during compulsory acquisition of land by the Government and the just compensation which should be paid promptly and in full to all persons whose interest in land has been affected.	The water pipeline is designed to be laid along existing easements and road reserves. The Act is useful in providing the legal framework for managing public land, facilitating the acquisition of private land for public benefit when necessary, and ensuring that affected landowners are fairly compensated during the implementation of the project.

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
Environment and Land Court Act, 2011	Article 162 of the constitution provides for the creation of specialized courts to handle all matters on land and the environment. Such a court will have the status and powers of a High Court in every respect. Article 159 on the principles of judicial authority, indicates that courts will endeavour to encourage application of alternative dispute resolution mechanisms, including traditional ones, so long as they are consistent with the constitution. Section 20, of the Environment and Land Court Act, 2011 empowers the Environment and Land Court, on its own motion, or on application of the parties to a dispute, to direct the application of alternative dispute resolution (ADR), including traditional dispute resolution mechanisms.	The Act will be useful in provision of guideline on resolving disputes that might arise related to land or environment.
Water Act, 2016	Article 43 of the Constitution stipulates that every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation. In conformity to this constitutional requirement, the Water Act, 2016 was enacted.	The proposed water networks Project is envisaged to provide reliable water to residents of Kisumu County in line with the provisions of this Act.
County Government Act No. 17 of 2012	The preamble to the Act gives overriding object and purpose of the Act. It states that, 'An Act of Parliament to give effect to Chapter Eleven of the Constitution; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes. Part II elaborate on the functions and powers of the county government, emphasizing its constitutional authority to enter into contracts, acquire and hold and dispose of assets, and delegate functions, such as through sub-contracts and partnerships.	PART VIII of the Act provided for Citizen Participation principles which include timely access to information, data, documents, and other information relevant or related to policy formulation and implementation among others. Similarly, implementation of the proposed Pipeline Project will be done through sustained public participation as provided for by this Act.
Physical and Land Use Development Plan Act 2019	Part IV of the Act provides objectives of development control which are to ensure orderly physical and land use development, to ensure the proper execution and implementation of approved physical and land use development plan and to protect and conserve the environment. Further section 56 provides that Subject to the provisions of this Act, the Urban Areas and Cities Act, 2011, and the County Governments Act, 2012, the county governments shall have the power within their areas of jurisdiction to consider and approve all development applications and grant all development permissions among other roles.	As guided by this Act, the project proponent will seek requisite approvals from the Kisumu County Director of Physical Planning prior to commencement of the works discussed in this report.
Occupational Health and Safety Act (OSHA 2007)	The Act provides Environment Health and Safety (EHS) Guidelines which shall be followed by both the Contractor and Supervising Consultant during implementation of the Project to avoid injuries and even loss of life to workers and neighbouring community.	OSHA is enforced by the directorate of occupational safety and health services (DOSHS). Further, the project contractor will be expected to register the site as a workplace with DOSHS and also engage the directorate in handling work related accidents.

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
HIV and AIDS Prevention and Control Act 2011	The objective and purpose of this Act is to (a) promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS; (b) extend to every person suspected or known to be infected with HIV and AIDS full protection of his human rights and civil liberties.	The Act provisions will be applied during Project implementation phase where the contractor will be required to create awareness among workers and community at large as well as other measures such as provision of condoms among others.
Sexual Offences Act 2006	An Act of Parliament that makes provision about sexual offences aims at prevention and the protection of all persons from harm from unlawful sexual acts and for connected purposes. Section 15, 17 and 18 focuses mainly on sexual offenses on minor (children).	In an effort to comply to provisions of this Act, the contractor will integrate Sexual Exploitation and Abuse (SEA) in job descriptions, employments contracts, performance appraisal systems, etc. Development of contract policies related to SEA, including whistle-blower protection and investigation and disciplinary procedures; training for all project management; management of coordination mechanism for case oversight, investigations and disciplinary procedures; supervision of dedicated SEA focal points in the project and trained community liaison officers among other measures.
Child Rights Act (Amendment Bill) 2014	This Act of Parliament makes provision for parental responsibility, fostering, adoption, custody, maintenance, guardianship, care and protection of children. It also makes provision for the administration of children's institutions, gives effect to the principles of the Convention on the Rights of the Child and the African Charter on the Rights and Welfare of the Child. Contractors implementing the various Project components envisaged under the Master Plan Study will be required to comply to provisions of the Act during Project implementation.	The contractor will undertake the below listed measures among others. The contractor will develop and implement a Children Protection Strategy that will ensure minors are protected against negative impacts associated by the Project including SEA. All contractor's staff must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behaviour
Labour Relations Act 2012	An Act of Parliament to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations or federations, to promote sound labour relations through the protection and promotion of freedom of association.	This Act will be applied by labour force on site in addressing disputes related to working conditions.
National Gender and Equality Commission Act 2011	The over-arching goal for NGEC is to contribute to the reduction of gender inequalities and the discrimination against all; women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities.	This Act will be applied during hiring of workforce on site especially during hiring of workers, the aim will be to ensure adequate representation of women in the Project.

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
The National Museums and Heritage Act 2006	An Act of Parliament to consolidate the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya; to repeal the Antiquities and Monuments Act (Cap. 215) and the National Museums Act; and for connected purposes.	This Act together with World Bank Policy OP 4.11 on Physical Cultural Resources will be quoted if the project encounters such materials. Chance Find Procedures have been provided in this report. The provisions of the Act are mainly enforced by the National Museums of Kenya (NMK)
Energy Act 2019	PART VIII provided for energy efficiency and Conservation of energy resources, the Act provides that factories and buildings and energy appliances by types, quantities of energy use, or methods of energy utilization for purposes of energy efficiency and conservation, as provided by the act safe handling of petroleum used by plant and equipment on site will be emphasized	Requirements for dealing in energy handling including safety are enforced by the Energy and Petroleum Regulatory authority (EPRA). EPRA will be instrumental in licensing the bulk storage of petroleum on site where necessary.
Traffic Act 2015	PART V of the Act provides driving and other offences relating to the use of vehicles on roads. The act provides explicit measures related to; Speed of motor vehicles, Penalties in relation to speed, driving under influence of drink, driving on pavement, pedestrian walkway, causing death by driving or obstruction, Reckless driving, Signals and signs to be obeyed, Condition of vehicles, Limitation of loads.	This Act will be cited in relation to construction phase on site. This act is enforced by the Traffic Police Department and the National Transport and Safety Authority (NTSA).
Public Health Act, CAP 242	This is an Act of Parliament which makes provision for good public sanitation and maintenance of health. Part III section 17-18 highlights on what the proponent should do in case of an outbreak of infectious diseases within the area. The infectious diseases apply to small pox, plague, cholera, typhus fever, acute poliomyelitis, rabies and many more as highlighted in this section. The Public Health Act makes provision for securing and maintaining health. For instance, the local authorities are supposed to take measures for preventing any pollution dangerous to health of any supply of water that the public uses for domestic purposes and purifying the sources that have been polluted. They are also supposed to act against persons causing pollution to the water sources.	The contractor will be required to provide sanitary facilities and solid waste containers for use by construction workers on site during construction phase.
Climate Change Act 2016	The Act establishes a cooperation called National Climate Change Council whose responsibility among others is to advise the national and county governments on legislative, policy and other measures necessary for climate change response and attaining low carbon climate change resilient development. The act further provides that the Cabinet Secretary shall, in accordance with Article 10 of the Constitution and section 3 of this Act, and through public consultation, formulate a National Climate Change Action Plan (NCCAP)	The proposed Project is among projects that align to provision of the National Climate Change Action Plan (NCCAP) efficient utilization and conservation of freshwater resources.

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
	In formulating the National Climate Change Action Plan, the Cabinet Secretary shall be informed by social circumstances in particular, the likely impact of the action plans, strategies and policies on biodiversity and ecosystem services among other measures.	
Penal code CAP 63	Chapter XVII on "Nuisances and offences against health and convenience" contained in the penal code strictly prohibits the release of foul air into the environment which affects the health of the persons. Section 191 of the penal code states that if any person that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence.	Human and Solid (refuse) Waste disposal and other project related activities shall be carried out in such a manner as to conform to the provisions of the code.
The Standards Act Cap 496	This Act promotes the standardization of the specification of commodities and provides for the standardization of commodities and codes of practice to ensure public health and safety. It establishes the Kenya Bureau of Standards (KEBS) and defines its functions as related to: promotion of standardization in industry and commerce; and Making arrangements or provision of facilities for the testing and calibration of precision instruments, gauges and scientific apparatus, for the determination of their degree of accuracy by comparison with standards approved by the Minister on the recommendation of the Council, and for the issue of certificates in regard thereto.	This means that the contractor under the supervision of the Engineer will ensure that all materials used on site adheres to the highest standards and do not pose any human health and safety risk.
The National Construction Authority Act, 2011	The Act provides for the establishment, powers and functions of the National Construction Authority (NCA). For accountability purposes, it requires all contractors to be registered and having valid annual practicing licenses. It also allows for public complaints against the contractor, which may trigger investigation by NCA into the conduct of such a contractor.	The proponent will only hire a licensed contractor to undertake the construction works. Complaints against the contractor will first be addressed through the project Grievance Redress Mechanism (GRM) and other measures only acting as a last resort.
Sustainable Waste Management Act, No. 31 of 2022.	The Act identifies the following objectives: sustainable waste management promotion; improving the health of all Kenyans by ensuring a clean and healthy environment; reduction of air, land, fresh water and marine pollution; ensuring the delivery of waste service; creating an enabling environment for employment in the green economy in waste management, recycling and recovery; circular economy practices promotion; mainstreaming resource efficiency principles in sustainable consumption; improving responsible public behaviour on waste and environment. The Act is based on the following principles: precautionary principle; polluter pays principle; payment for ecosystem services; zero waste principle.	The contractor will incorporate waste management strategies to handle construction debris and other waste products effectively.

ACTS	RELEVANCE	APPLICABILITY TO THE PROJECT
Roads Act, 2007	The Act is relevant to the water pipeline project as it mandates obtaining necessary permits and approvals for road crossings, adhering to construction standards and safety measures to protect road infrastructure, and conducting impact assessments to minimize disruptions to traffic and road conditions.	The project will ensure compliance by coordinating with road authorities, following guidelines for trenching and reinstatement, and implementing mitigation measures to manage any potential impacts on road networks.
Urban Areas and Cities Act	The Act is relevant to the water pipeline project in Kisumu City as it provides a framework for effective urban management and infrastructure development. The Act emphasizes the importance of improving urban infrastructure, engaging residents in governance, and supporting sustainable development.	The projects aims to improve water supply by addressing critical water needs hence contributing to the city's overall growth and infrastructure development.

3.4. Regulations And Rules

Applicable Regulations and Rules as summarized in **Table 5** were reviewed.

Table 5: Regulations and Polices

Regulation	Relevance	Applicability to the Project
The Environmental (Impact Assessment and Audit) Regulations, 2003	The regulation provides a framework under which Environment Impact Assessment for the Factory is prepared, Regulation 4(1) further states that: (a) "…no Proponent shall implement a project: likely to have a negative environmental impact. (b) 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…"	Provisions of the regulations were applied during preparation of this report.
Environmental Management and Coordination (Water Quality) Regulations, 2006	Regulation 9 of these regulations provides for water quality monitoring. It states that the "Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations". The regulations provide 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). Construction of the dam provides for sustainable management of such water resources.	Provisions of the regulations were applied during preparation of this report.

Regulation	Relevance	Applicability to the Project
(Waste Management Regulations, 2006	Regulation 4 (1) states that "no person shall dispose of any waste on a public highway, street, road, recreational area or in any place except in a designated receptacle". Regulation 4 (2) further states that "a waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations".	The contractor will use provisions of this regulation to ensure that waste is handled, stored, transported and disposed as per this regulation.
Noise and Excessive Vibration Pollution (Control) Regulations, 2009	The Contractor 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 shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting by vehicles. The regulations provide for a maximum of 60 dBA during the day and 35 dBA during the night for a construction site.	Provisions of the regulations were applied during preparation of this report.
The Environmental Management and Coordination (Air Quality Regulations 2014)	These regulations provide a framework for management of plant and equipment emissions of hydrocarbons on site. The regulations require that all plant and equipment on site should be well serviced to manufacturers specifications to avoid air pollution, the regulation also require monitoring of baseline air quality within construction site and implementation of correction action where the standards are not complied to.	Water spray will be used at all times when working in dry areas to avoid risks associated with dust menace. Particulate matter (PM_{10}), equipment's will be operated as provided by manufacturers specification to eliminate cases of Oxides (SOx), Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC).
Fire Risk Reduction Rules, 2007	The rules require electrical equipment be installed in accordance with the respective hazardous area classification system, flammable materials are stored in appropriately designed receptacles, electrical equipment is inspected after six months by a competent person and the Proponent is required to keep records of such inspections, installation and maintenance of firefighting systems in workplaces, fire drills at least once a year, assembly points be marked, undertake annual fire safety audits etc.	The contractor will be required to store all flammable materials and liquids safely to avoid risk of fire.
Medical Examination Rules, 2005	It requires workers on site to undergo regular medical examination to identify the symptoms of hazardous exposures on the body, especially those who handle food or food products. This is with a sole purpose of monitoring exposure for remedial action.	The contractor will institute and implement regular medical examinations for its staff at the facility. These will include COVID 19 temperature check-up and drug abuse (at least alcohol on daily basis).
Safety and Health Committee Rules of 2004	These rules require the proponent and contractor (once they employ a more than twenty persons) to establish a committee to address the health, safety and welfare of workers. The Proponent and by extension the contractor, are required to provide space for meetings for the committee, training of the S&H Committee, appoint a S&H management representative, as well as allowing all staff to attend these meetings with no risk of loss of earnings, opportunities for promotion or advancement. They should also make legislation on occupational safety and health available to the Committee.	The contractor will develop a clearly defined safety and health policy and bring it to the notice of all employees at the workplace. They are also required to implement and review the policy when need arises. If construction workers exceed 20, the contractor will facilitate the formation of a S&H Committee and its operations.

Regulation	Relevance	Applicability to the Project
First-Aid Rules, 1977	Rule 7 of First-Aid Rules, 1977 require that (No person shall be placed in charge of a first aid unless he has received adequate training and holds a certificate of competence	The contractor will conduct first aiders' training for the first time and a refresher training Bi-annually.
Water Management Regulations 2021	Matters covered by these Regulations include: prescription of water use activities; issue of approvals, permits and authorizations for water use and waterworks; guidelines on surface water, including declaration of a watercourse, wetlands, land reclamation, water use for irrigation and Works Associated for protection and control of fish; groundwater development, including borehole and issue of specific permits and authorizations; water quality monitoring and liquid waste disposal, including control of water pollution, water quality monitoring; inspection and controls concerning waterworks; water use charges, including penalties for misuse or for over-abstraction; roles and powers of water resource users associations and basin water resources committees; identification of protected and designated groundwater conservation areas; composition of reserve; categories of water sector professionals and contractors and issue of related permits and licences	The project will adhere to these Regulations by obtaining all necessary approvals, permits, and authorizations for water use and construction activities. It will comply with guidelines for surface and groundwater management, implement water quality monitoring and pollution control measures, and ensure regular inspections. The project will respect protected and designated areas, collaborate with local water resource associations, and employ licensed water sector professionals.
Extended Producer Responsibility Regulations 2022	Aims to extend the responsibility of producers over their products and packaging throughout their entire life cycle. The regulations also provide a framework for the establishment and operation of mandatory extended producer responsibility schemes and promote a collaborative approach to the management of products and associated wastes.	The contractor will ensure that materials used, including pipes and construction supplies, are managed in a way that minimizes environmental and health impacts. The project will focus on selecting recyclable and recoverable materials, managing hazardous substances carefully, and implementing cost-effective waste management strategies.

3.5. World Bank Operational Safeguard Policies

Applicable World Bank Safeguard Policies that are triggered by the project are summarized in **Table 6**.

Table 6: World Bank Safeguard Policies

Safeguards Policies	Provision	Relevance to the Project
World Bank OP 4.01 on Environmental Assessment	Provides framework for WB environmental safeguard policies and describes project screening and categorization to determine level of environmental assessment required. For category A and B projects the policy requires public consultation and disclosure to be undertaken as part of the EA process. If indigenous people are found to be affected, in addition to consultation, it is necessary to prepare a plan to avoid or mitigate adverse impacts on such groups and ensure that they have access to project benefits to the extent that they wish to.	An Environmental and Social Impact Assessment of Proposed Project Components is required and therefore the need for this report.
World Bank OP 4.12 On Involuntary Resettlement	The policy provides that Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative Project designs. Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs. Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher	Triggered as PAPs has been identified in Kisumu CBD who will be compensated for the loss of business as per the PAPs register in Appendix E. .
World Bank OP 4.11 on Physical Cultural Resources	Provides for measures to protect cultural heritage from the adverse impacts of project activities and support its preservation;	Requires assessment for any physical cultural resources or requires preparation of chance find procedures be prepared during implementations of Projects. Appended to this ESIA are chance find procedures to be adopted in the event such resources are encountered during Project construction phase.

3.6. World Bank Group Environmental Health and Safety Guidelines on Water and Sanitation

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry- specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards.

These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document discussed in 6.4 (above), which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

Application of the EHS Guidelines to existing facilities may involve the establishment of site -specific targets, with an appropriate timetable for achieving them.

Relevance to the Project

The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of:

i. Potable water treatment and distribution systems

ii. Collection of sewage in centralized systems or decentralized systems and treatment of collected sewage at centralized facilities.

The above discussed Guidelines/ Instruments, present Environmental Health issues concerned with Water Distribution and the necessary requirement to assure adequate capacity to supply the water demand.

The most significant environmental issues associated with operation of water distribution systems include: Water system leaks, loss of pressure and water discharges. The design for the project has ensured these environment risks are mitigated.

3.7. Relevant SDGs

Sustainable Development Goal (SDG)	Goal Description	Relevance to the Project
SDG 6: Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all.	▪ **Improved Water Supply and Sanitation Services:** The primary objective of the WSDP is to enhance water supply and sanitation services. By replacing old and faulty pipelines, the project aims to improve water quality and reduce health risks associated with inadequate infrastructure. This directly contributes to SDG 6 by ensuring access to safe and reliable water and sanitation services. ▪ **Reduction of Physical Water Losses:** The overhaul of pipelines, including the replacement of asbestos pipes, will reduce water losses due to leaks and bursts. This

Sustainable Development Goal (SDG)	Goal Description	Relevance to the Project
		improvement in infrastructure not only conserves water but also enhances the efficiency of water supply systems. ▪ **Health Risk Mitigation:** Replacing asbestos pipes addresses health risks associated with asbestos, aligning with SDG 6's target to improve water quality and reduce water contamination.
SDG 3: Good Health and Well-Being	Ensure healthy lives and promote well-being for all at all ages.	▪ **Reduction of Health Risks:** By replacing asbestos and outdated pipelines, the project minimizes exposure to harmful substances and reduces waterborne diseases, contributing to better public health. Improved water quality directly impacts community health, which is a key target of SDG 3. ▪ **Enhanced Water Quality:** The project's focus on improving water quality through pipeline upgrades ensures safer drinking water, thereby promoting overall well-being and reducing health hazards.
SDG 9: Industry, Innovation, and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.	▪ **Infrastructure Development:** The overhaul and upgrade of water supply pipelines represent a significant improvement in infrastructure. Upgrading to DN250 specifications and replacing old pipes with modern materials fosters resilient infrastructure. ▪ **Support for Financial Recovery:** The project's role in supporting the financial recovery of WSPs aligns with SDG 9's aim to enhance infrastructure resilience and sustainability.
SDG 13: Climate Action	Take urgent action to combat climate change and its impacts.	▪ **Reduction of Water Losses:** Efficient water management practices, such as reducing physical water losses, contribute to better water conservation and climate resilience. By minimizing leaks and bursts, the project supports sustainable water use and management, which is essential for climate adaptation and mitigation efforts.
SDG 1: No Poverty	End poverty in all its forms everywhere.	▪ **Economic Impact:** Improved water infrastructure can lead to increased economic opportunities and improved living standards for communities. By enhancing water supply and sanitation services, the project contributes to poverty reduction by ensuring access to essential services, which can improve overall quality of life.
SDG 11: Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient, and sustainable.	▪ **Urban Infrastructure:** The pipeline project supports the development of sustainable urban infrastructure by upgrading and replacing old pipelines. This contributes to making urban areas more resilient and sustainable, addressing the needs of growing populations and improving living conditions.

3.8. Relevant Biodiversity Treaties

Treaty	Purpose	Relevance to Kisumu Pipeline Project
Convention on Biological Diversity (CBD)	Aims to conserve biological diversity, promote sustainable use, and ensure fair benefit-sharing.	The project must ensure the protection of protected areas like Kisumu Impala Sanctuary and mitigate impacts on local flora and fauna. It also promotes sustainable management of ecosystems impacted by construction activities.

Treaty	Purpose	Relevance to Kisumu Pipeline Project
Ramsar Convention on Wetlands	Focuses on the conservation of wetlands and their resources.	With several wetlands and rivers within the project AoI, adherence to Ramsar guidelines will ensure that these critical ecosystems are protected from pollution and disruption. This includes measures to prevent contamination of Kibos, River Wigwa, and Nyamasaria Rivers.
African-Eurasian Migratory Waterbird Agreement (AEWA)	Protects migratory waterbirds and their habitats.	The project area is a migratory stopover for various bird species. AEWA guidelines should be followed to avoid disrupting migratory patterns, especially during key migration periods. Noise and light pollution should be minimized to protect bird species.
IUCN Red List of Threatened Species	Provides information on the conservation status of species.	The project must consider species listed on the IUCN Red List, such as the Pink-backed Pelican. Ensuring that construction does not negatively impact these species' habitats or populations is crucial for conservation.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Regulates international trade in endangered species.	While the project primarily involves infrastructure development, it is important to ensure that no endangered species, particularly those listed under CITES, are affected by the construction activities. Proper measures should be in place to avoid illegal trade or disturbance.

4. BASELINE INFORMATION

4.1. Physical Environment

4.1.1. Physiographic Characteristics

The county lies in a down warped part of large lowland surrounding the Winam Gulf, at the tip of which is Kisumu Town. East of Kisumu Town is the Kano Plains occasionally broken by low ridges and rivers. There are some notable physical features such as the scarps in the north, east and south. Others include the hill slopes and piedmont plains spreading across the vast Kano Plains.

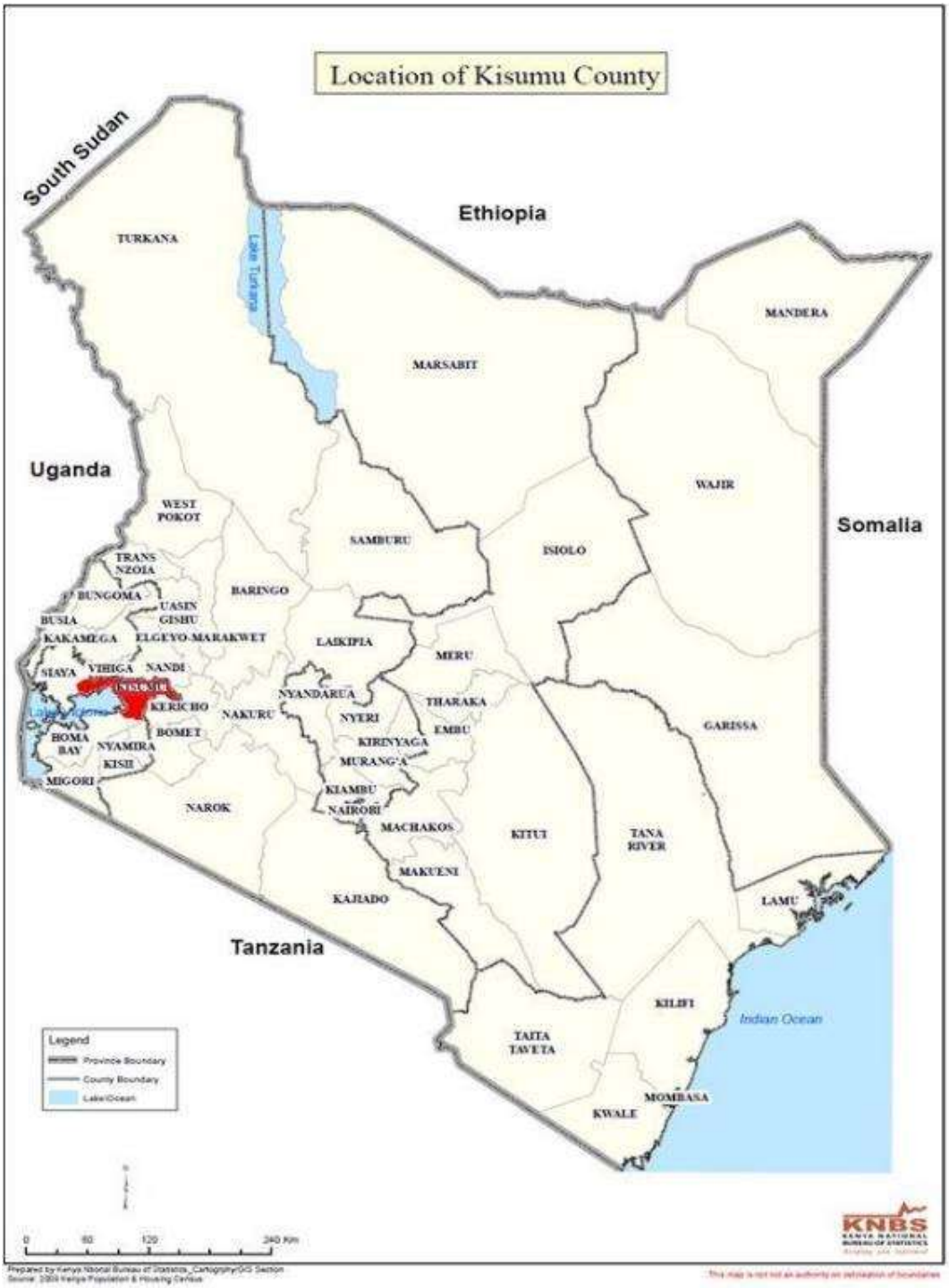
The county can be divided into 3 topographical zones namely: the Kano Plains, the upland area of Nyabondo Plateau and the midland areas of Maseno. The Kano Plains lie on the floor of the Rift Valley, which is a flat stretch bordered to the North and East by the escarpment, while the upland area comprises ridges which rise gently to an altitude of 1,835m above sea level.

The major physical features in the county are the overhanging huge granite rocks at Kisian and the legendary Kit Mikayi in Kisumu West Sub-county, the Lake Victoria, which is the second largest fresh water lake in the world, the geographically famous rice-growing Kano Plains, and lake islands (e.g. Ndere National Park which are major tourist attraction). The granite rocks are exploited (in small scale) by the local population to produce building ballast. While the varying types of soils and rivers deposits are mined for building sand and baked bricks for building in Maseno and Nyakach.

There are three major rivers flowing into the Winam Gulf namely: the Nyando, Kibos and Sondu. The rivers are heavily silted, resulting in the extensive formation of lakeside swamps. The Kano Plains, due to the structure on the floor of these escarpments is vulnerable to flooding during heavy rains especially the lower Kano Plains and in particular low lying areas of Nyando.

The county has a long shoreline along Lake Victoria. This shoreline is 90 km long and has more than 17 beaches all of which are fish landing bays. Within Kisumu City, the shores have been used to put up beautiful tourist hotels like Kiboko Bay, the Yatch Club and Tilapia Beach Resort.

Map 1: Location of the Kisumu County in Kenya



The project area is dominated by various land uses including residential, commercial, institutional and industrial all of which are likely to be affected by proposed project activities. Due to the fact that implementation of the project will be carried out along the road reserve, significant impact on vegetation features is not anticipated.



Figure 4-1: *Residential houses in Gudka Estate*



Figure 4-2: *Businesses along the road reserve near Arina Primary and junior secondary school*



Figure 4-3: *Residential land use in Arina Estate*



Figure 4-4: *Residential land use in Arina Estate*

The vegetation structure found within the project area is predominantly ornamental trees, flowers and exotic trees planted as fences around residential and business premises. Tree species within the project area include the following:



Figure 4-5: *Gravellea trees*



Figure 4-6: *Eucalyptus trees*



Figure 4-7:*Eucalyptus polybractea species*



Figure 4-8: *Finger euphorbia*

Note: the project will not affect these trees.

The main source of energy within the proposed project area is electricity from the national grid. Other sources of energy include diesel generators within business premises, kerosene, charcoal and firewood. Water within the area is obtained from pipe system of Kisumu Water and Sanitation Company, boreholes and shallow wells while sanitation facilities within the project area include KIWASCO sewerage system and pit latrines.

Most roads within the Kisumu CBD area are done to bitumen standards while storm water drainage system is available while in Guba area and parts of Arina and Gudka, most roads are earth with murram.



Figure 4-9: *Drainage at Guba*



Figure 4-10: *Swampy area in Guba*

4.1.2. Ecological conditions

The soils are dominated by lake sediments, commonly sand and clay soils. In Kano Plains the soils are dark brown and grey, poorly drained and are generally very deep and firm. In the western part of Kano Plains are dark cotton soils commonly associated with the swamps. These types constitute more than 70 per cent of all soil types found in Kisumu County. These soils are suitable for brick making and sand harvesting especially at Maseno and Nyakach.

The main cash crops in the county are sugarcane, rice and cotton. Sugarcane is predominantly grown at lower midlands which are common in Maseno, Muhoroni and Miwani while cotton is grown in Kadibo and Nyando.

4.1.3. Climatic Conditions

a) Rainfall

The mean annual rainfall varies with altitude and proximity to the highlands along the Nandi Escarpment and Tinderet. The area has two rainy seasons, with the long rains occurring in March and May while the short rains occur in September to November. During the short rains the average annual rainfall ranges between 450mm and 600mm. Rainfall data indicates that the county largely receives substantial rainfall. Maseno has a mean annual rainfall of 1,630mm, Kisumu 1,280 mm, Ahero 1,260 mm, Kibos 1,290 mm, Muhoroni 1,525 mm, and Koru 1,103 mm. The lowland area which forms a trough of low rainfall receives a mean annual rainfall of between 1,000mm and 1,800mm. Although there is no entirely dry month, the peak generally falls between March and May, with a secondary peak in September to November. The high rainfall and the nature of soils in the Kano Plains have supported small scale agricultural production. However, small-scale farmers find it difficult to prepare the land for planting since black cotton soils are difficult to work on manually during dry season and also during heavy rains.

b) Temperature

The mean annual maximum temperature ranges 25^{o}C to 35^{o}C and the mean annual minimum temperature ranges 9^{o}C to 18^{o}C. The altitude in the county varies from 1,144 metres above the sea level on the plains to 1,525 metres above sea level in the Maseno and Lower Nyakach areas. This greatly influences temperatures and rainfall in the county.

4.1.4. Climate and Air Quality

The climate of Kisumu City is tropical characterized by hot and humid days. It receives relatively significant rainfall throughout the year with two peaks in April (228mm) during the long rains and November (126mm) during the short rains. The least rainfall falls with the month of January and averages 50mm. Temperatures are fairly constant throughout the year averaging highs of 29^{0}C and lows of 19^{0}C. The hottest months are between December to March with relatively cooler temperatures experienced during the two rainfall seasons. Humidity varies from a low of 4% in July to a high of 51% during the month of May. The windier part of the year lasts from November to March with average wind speeds of more than 9Km/hr. From March to October the wind speeds average about 7km/hr. The seasonal variations in the amount of rainfall received influences water volumes in Lake Victoria, sediment loads, agricultural and socio-economic activities and the growth and dispersal of aquatic macrophytes as a result of nutrient loading through river systems. Wind and currents are important drivers in the movement and dispersal of marshes of aquatic macrophytes in Lake Victoria and therefore influence navigation and socio-economic activities.

Table 7: Weather by month // weather averages Kisumu

(Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	23.6 °C (74.5) °F	24.6 °C (76.3) °F	23.9 °C (75) °F	22.8 °C (73) °F	22.5 °C (72.4) °F	22.4 °C (72.3) °F	22.5 °C (72.4) °F	22.7 °C (72.9) °F	23.2 °C (73.8) °F	23.2 °C (73.7) °F	22.7 °C (72.8) °F	22.9 °C (73.1) °F
Min. Temperature °C (°F)	18.4 °C (65.2) °F	19.1 °C (66.4) °F	18.9 °C (66) °F	18.5 °C (65.4) °F	18.2 °C (64.7) °F	18 °C (64.4) °F	18 °C (64.4) °F	18.1 °C (64.6) °F	18.3 °C (64.9) °F	18.6 °C (65.4) °F	18.1 °C (64.7) °F	18 °C (64.4) °F
Max. Temperature °C (°F)	29.2 °C (84.5) °F	30.6 °C (87.1) °F	29.4 °C (84.9) °F	27.4 °C (81.4) °F	27 °C (80.7) °F	26.9 °C (80.4) °F	26.9 °C (80.3) °F	27.3 °C (81.2) °F	28.2 °C (82.8) °F	28.1 °C (82.5) °F	27.6 °C (81.6) °F	28 °C (82.3) °F
Precipitation / Rainfall mm (in)	115 (4)	94 (3)	190 (7)	288 (11)	213 (8)	109 (4)	98 (3)	107 (4)	113 (4)	202 (7)	248 (9)	189 (7)
Humidity(%)	60%	54%	63%	74%	73%	68%	64%	64%	63%	66%	69%	66%
Rainy days (d)	11	10	15	20	19	15	14	14	15	19	18	15
avg. Sun hours (hours)	10.2	10.3	9.7	9.2	9.4	9.7	9.8	9.9	10.0	9.8	9.6	9.8

Data source: Climate-Data.org

Air Quality

The mixer of social, institutional and commercial activity defines the air quality in an urban setting. Kisumu City has similar characteristics with the main air quality components influenced by the transport activities (mainly petroleum residuals and byproducts) and industrial activities including vehicle repair garages. Key air quality components include carbon dioxide, particulate matter, carbon monoxide, nitrogen oxides, and sulphur oxides. Particulate matter (dust) arises from road surfaces, factory chimneys and vehicular exhausts. Due to the varying sources of air pollutants, the quality also varies and so are the related impacts especially on human beings. The high dispersal from the winds is likely to maintain the effective air pollutant concentrations very low. The proposed sites are not major emitters of air pollutants.

As the project is not expected to generate major air pollution, this parameter is only described qualitatively in terms of existing sources of air pollution. The major existing source of emissions in proximity to the site is the moderately busy main road (Kisumu-Busia and Kisumu – Kakamega roads with associated service lanes).

The main air pollutants in this area are associated with minimal exhaust emissions and fugitive dust (from trucks and heavy construction equipment using this roadway). Dustiness in the area is related to wind and rainfall conditions and is predicted to be at its maximum levels during dryer periods of the year (June to October and, January to February).

Noise

As in the case of ambient air quality, this project is not expected to result in a significant change to ambient levels of noise in the area. Consequently, this parameter is only described qualitatively in terms of existing sources of noise. The sources of noise are the same as the sources of air pollution in the area, and include:

a) Vehicular traffic along the major roads.

b) Construction material haulage operations and,

c) Any potential project component depending on intention of use (i.e. mechanical pumps)

4.1.5. Assessment of climate risks

Heavy Rainfall and Flooding: Kisumu experiences substantial rainfall, especially during the long rains (March to May) and short rains (October to December). Increased precipitation poses a risk of flooding, which can damage pipelines and disrupt the water supply. Flooding can also lead to erosion and sedimentation, compromising water quality and pipeline integrity across all project areas.

Erosion and Soil Degradation: High rainfall can cause erosion, particularly in areas with gentle slopes like those covered by the Kamaler-Guba Upgrade Works. This erosion can undermine pipeline supports and lead to sedimentation, affecting water quality and infrastructure stability. In addition, increased temperatures and drought conditions can lead to soil degradation, complicating excavation and installation efforts, particularly in the Arina, Gudka, and Lower Railways Estates.

Temperature Extremes and Drought: Higher temperatures and prolonged droughts can strain water resources and increase demand on the infrastructure. The areas covered by the Arina, Gudka, and Lower Railways Estates Overhaul Works may face challenges related to reduced water availability, affecting the efficiency of the water distribution system.

Mitigation Measures:

1. **Enhanced Drainage and Erosion Control:** Enhanced drainage systems should be implemented along pipeline routes to manage stormwater and reduce flood risks. Erosion control measures, such as vegetation planting and silt fences, will help prevent sedimentation and protect pipeline integrity.
2. **Water Storage Solutions:** Additional water storage solutions, such as reservoirs or rainwater harvesting systems, should be incorporated. These solutions will help buffer against variability in water availability and ensure a more reliable water supply.
3. **Soil Stabilization and Adaptive Design:** Employ soil stabilization techniques to ensure stable conditions for excavation and installation. Infrastructure should be designed with materials and construction methods that can withstand both high temperatures and changing soil conditions.

4. **Regular Maintenance and Monitoring:** Establish a regular maintenance schedule to inspect and repair any damage caused by extreme weather events. Implement monitoring systems to track the effectiveness of climate adaptation measures and make necessary adjustments to improve resilience.

Compliance with the Climate Change Act, 2016

The Climate Change Act, 2016 mandates the integration of climate change responses into development planning. To ensure compliance, detailed climate risk assessments should be conducted for each phase of the project to identify and address potential impacts. Climate resilience should be incorporated into project design, with adaptive measures to withstand extreme weather events. Engaging with local communities and stakeholders will ensure that adaptation measures are practical and address local needs. Regular reporting and monitoring of adaptation measures will ensure ongoing effectiveness and alignment with the Act's requirements.

4.1.6. Water Quality and Hydrology

Water Quality:

Water quality in Kisumu varies significantly across different sources:

- **Temperature:** Water temperature in Kisumu ranges from 21.06°C to 30.75°C, within WHO's recommended limits of below 40°C.
- **pH:** The pH of water ranges from 5.51 (slightly acidic) near Lake Victoria to 8.79 (slightly alkaline) in the lake itself. Around 80% of the wells meet WHO standards for pH, while the remaining 20% are either slightly acidic or alkaline.
- **Dissolved Oxygen:** River water exhibits the highest concentrations of dissolved oxygen, while spring water shows the lowest.
- **Electrical Conductivity and Salinity:** Shallow wells near Lake Victoria have the highest levels of mineralization, with electrical conductivity reaching up to 3500 µS/cm and salinity at a maximum of 2.01 PSS.
- **Turbidity:** Turbidity is highly variable, with higher levels observed during the wet seasons. The highest recorded turbidity was 2000 NTU in River Kibos during a storm, whereas the lowest was 1.1 NTU during the dry season.

Hydrology:

Groundwater plays a crucial role in Kisumu's water supply, especially in areas not served by piped water systems or during periods of shortages. The city's shallow aquifer is an essential source of water for many residents, particularly in informal settlements. However, the widespread use of pit latrines in Kisumu, combined with the shallow groundwater table, has led to severe microbial contamination of groundwater resources.

The study conducted by Kanoti et al. (2020)[1] revealed that shallow wells and springs in densely populated areas like Obunga and Manyatta were heavily contaminated with faecal

[1] Kanoti, J. R., Olago, D. O., Akech, N. O., Nyamoi, C. M., Dulo, S., Ayah, R., & Taylor, R. (2020). Sanitation challenges, groundwater perspectives and their intertwined relationships in Kisumu, Kenya. *Kenya Policy Briefs*, 1(1). University of Nairobi. Published by Office of DVC Research, Innovation and Enterprise. Retrieved from https://uonresearch.org/journal/kpb.

bacteria, making the water unsafe for human consumption. The heterogeneity of Kisumu's hydrogeological properties further complicates groundwater management. Pumping tests indicated varying groundwater yields, with some areas like Manyatta B yielding up to 4 m^3/hour, while others, such as Riat, yielded less than 1 m^3/hour due to different geological formations. This variability poses challenges for the sustainable use of groundwater, as localized aquifer units may not be able to meet the growing water demand.

The county's hydrology is also shaped by several river basins, including the Nyando, Sondu, Yala, Kibos, Oroba, and West Shoreline rivers. These rivers, along with the substantial rainfall received, particularly in the northern parts of the region, contribute significantly to Kisumu's surface water resources.

The Nyando River Basin, with a catchment area of about 3,625 square kilometers, is characterized by steep slopes, especially in the upper basin. This topography results in significant soil erosion, leading to siltation issues downstream. The Nyando River is a critical water source for agriculture, domestic use, and environmental sustainability in Kisumu. However, the basin's hydrology is under threat from deforestation, soil erosion, and sedimentation, all of which negatively impact water quality and availability.

The Sondu River Basin, covering an area of 3,510 square kilometers, experiences high rainfall, ranging from 1,400 to 1,900 millimeters annually. The basin supports a range of activities, including agriculture and hydropower generation. However, infrastructure developments like the Magwagwa Multipurpose Dam have implications for water flow and distribution, potentially affecting downstream communities in Kisumu and neighboring counties.

The Yala River Basin spans approximately 3,300 square kilometers, receiving an average annual rainfall of 1,200 to 2,000 millimeters. The basin's topography ranges from highlands in Uasin Gishu and Nandi counties to lowlands near Lake Victoria. The Yala River is essential for agricultural irrigation and domestic water supply, though the basin's lower section, particularly the Yala Swamp, faces challenges related to waterlogging and sedimentation.

The Kibos River Basin, covering about 310 square kilometers, is primarily located in Nandi and Kisumu counties. The river, which drains into the Winam Gulf, contributes to Kisumu City's water supply. However, the Kibos River is seasonal, leading to variability in water availability, especially during dry periods, which impacts agricultural activities and the reliability of water supply.

Similarly, the Oroba River Basin, covering 575 square kilometers, is highly influenced by rainfall patterns, resulting in a seasonal and intermittent flow. This seasonality limits its use for irrigation and domestic supply, making water storage and management critical for sustaining water availability throughout the year.

The West Shoreline Rivers Basin comprises several small rivers, including Awach Seme, Awach Muguruk, and Kysian, primarily located in Kisumu and Siaya counties. These rivers contribute to the water supply for local communities and support small-scale agriculture. However, their small size and proximity to urban areas make them vulnerable to pollution and over-extraction.

4.1.7. Soil

The soils in Kisumu County are dominated by the former lake sediments, commonly sands and clay soils. In Kano plains, the soils are poorly drained and are generally very deep and firm. They are dark brown and grey in colour. In the western part of the Kano plains are the dark cotton soils commonly associated with swamps. On the slightly elevated grounds and piedmont plains are clay soils, which are usually of moderate fertility. On the uplands are sandy soils, which are derived from intermediate igneous rocks. These soils are also imperfectly drained and reasonably deep. The Northwestern part of Kisumu has ferrasols and acrisols which have developed from the granites of rocky south Kakamega uplands. These soils are of low fertility and have rock bases not more than 80cm from the surface. On the fringes of the Winam Gulf and Lake Victoria beach ridges are soils of varying fertility, most of which are susceptible to water logging. The black cotton soil is found mainly in the plains while the upper zones are marked with residuals of brown volcanic soils. In some areas, the soils are rocky giving rise to sandy soils.

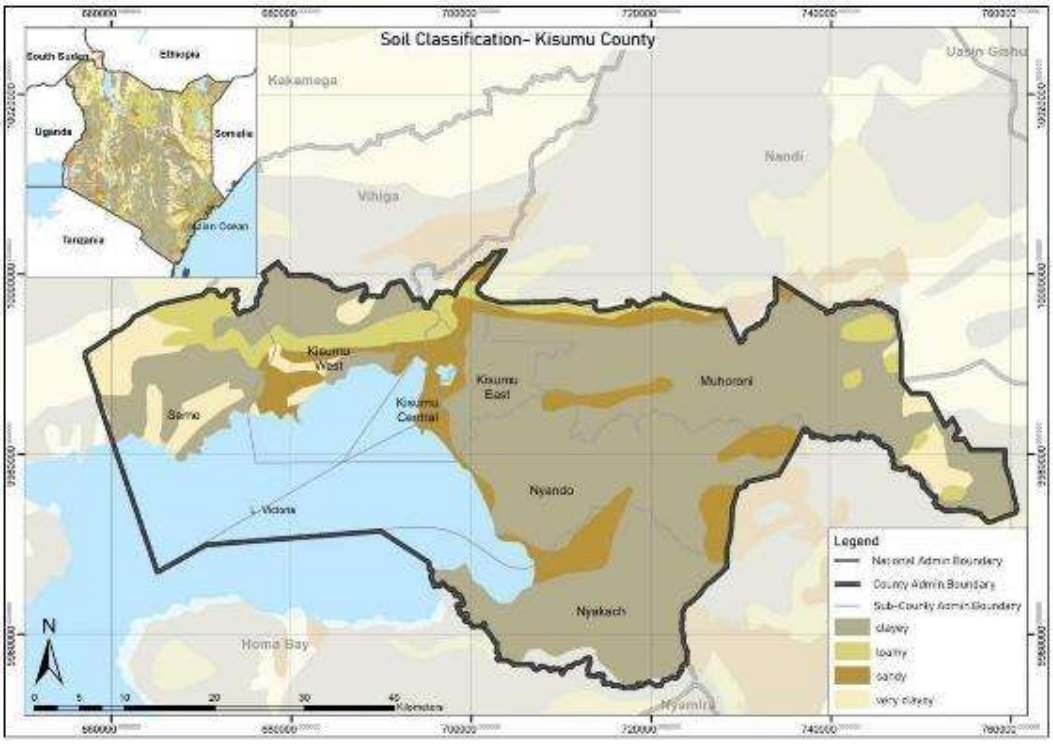


Figure 4-11: Kisumu County Soil types

4.1.8. Geology and Hydrogeology

Deposits of Pleistocene to recent age include hill wash gravels (colluvium), semi consolidated river alluvium, quartz rubble and lateritic ironstone capping. Brown sandy soils with occasional and locally distributed deposits (laterites) occur in the project areas. The subsurface geology of the project area comprises of intrusive rock. Outcrops of these granites are noted within the vicinity confirming them as the host rock. In hand specimen they are dense, coarse grained felsic rocks. Occasionally, minute feldspar crystals are recognizable to unaided eye.

4.1.9. Soil erosion, stability& Landslides

Kisumu, being located on the shores of Lake Victoria, may face challenges related to erosion along the lakefront. Wave action, especially during storms, can erode shorelines. Urban

development, if not properly planned, can contribute to increased runoff and erosion. Poorly managed construction sites may also be prone to soil erosion.

4.1.10. Land use

Industrial Land use

The current major land uses in Kisumu are for industrial, commercial and residential purposes. The industrial area is situated close to the lake and runs parallel to the lakeshore. The area is served mainly by the railway and acts as the terminus of the two railway lines that connect Kisumu with the rest of Kenya. The industrial area is separated from other land uses by Makasembo road and extends towards the airport in the northwest. In 1969, the industrial zone covered a mere 6.5% of all land uses in Kisumu (Kenya Government 2004) but it has since expanded in two directions: along the road to Maseno in the northwest and along the road to Chemelil in the northeast.

Commercial land use

The Central Business District (or CBD) is main area of commercially used land in town. The northern section of the CBD predominantly consists of the central and local government administrative offices, whereas the central portion consists of modern offices, department stores and branches of Nairobi-based companies.

Residential land use

The residential zone covers the greatest portion of urban land in Kisumu. Distinct subdivisions of residential areas related to the historical growth of the town can also be noticed. Kisumu's residential land use falls into three main categories namely:

(i) The high-class residential areas including Milimani, Robert Ouko, Tom Mboya and Okore in the northern suburbs of the town;
(ii) Low and middle income/ public housing areas including the municipal houses, railway houses, Kenya post, Kenya Power etc. most of which dominate the eastern side of the town; and
(iii) The peri-urban, slum settlements and the rural extended boundary areas.

Surrounding the central part of the town is a belt of unplanned slum and informal settlements that has developed to form a semi-circle around the old town. These include Nyalenda, Manyatta, Bandani, Kibos, Nyamasaria, Pandpieri, Migosi and Obunga. Manyatta Arab and Kaloleni alone are located within the CBD. The average plot sizes in the neighbourhoods and estates are quarter acres, which are normally freeholds with titles issued. But in some estates, the residents have an average plot size of 0.8 acres and on a freehold ownership with no titles issued.

Agricultural land use

Rice is grown under irrigation in the Kano Plains. Most of the water for irrigation comes from River Nyando, whose annual floods displaces huge numbers of people but also deposit a lot of fertile silt all across the plain. The northern and eastern fringes of the Kano Plains also play host to some of Kenya's most productive sugarcane fields. Towns like Kibos, Miwani and Chemelil are centres of sugarcane production. Kisumu County also produces maize, beans, sweet potatoes, poultry and fresh vegetables. The project area has local cattle, sheep, Goats, chicken.

The photos and maps below highlight the land use within the project areas.



Figure 4-12: *Residential land use in Gudka Estate*



Figure 4-13: *Sweet potato farming in Guba area*



Figure 4-14: *Pastoralism in Guba*

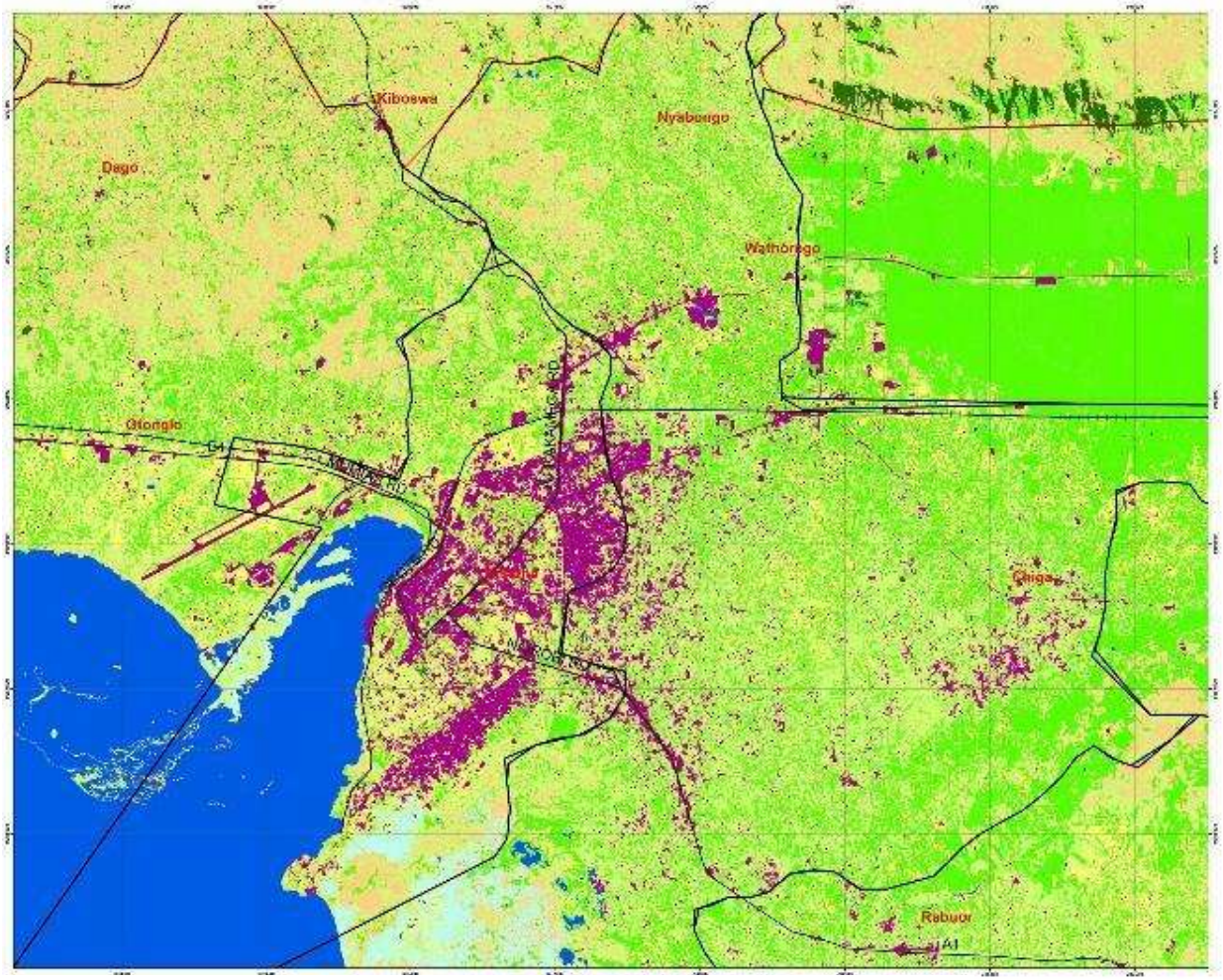


Figure 4-15: *Banana along the road*



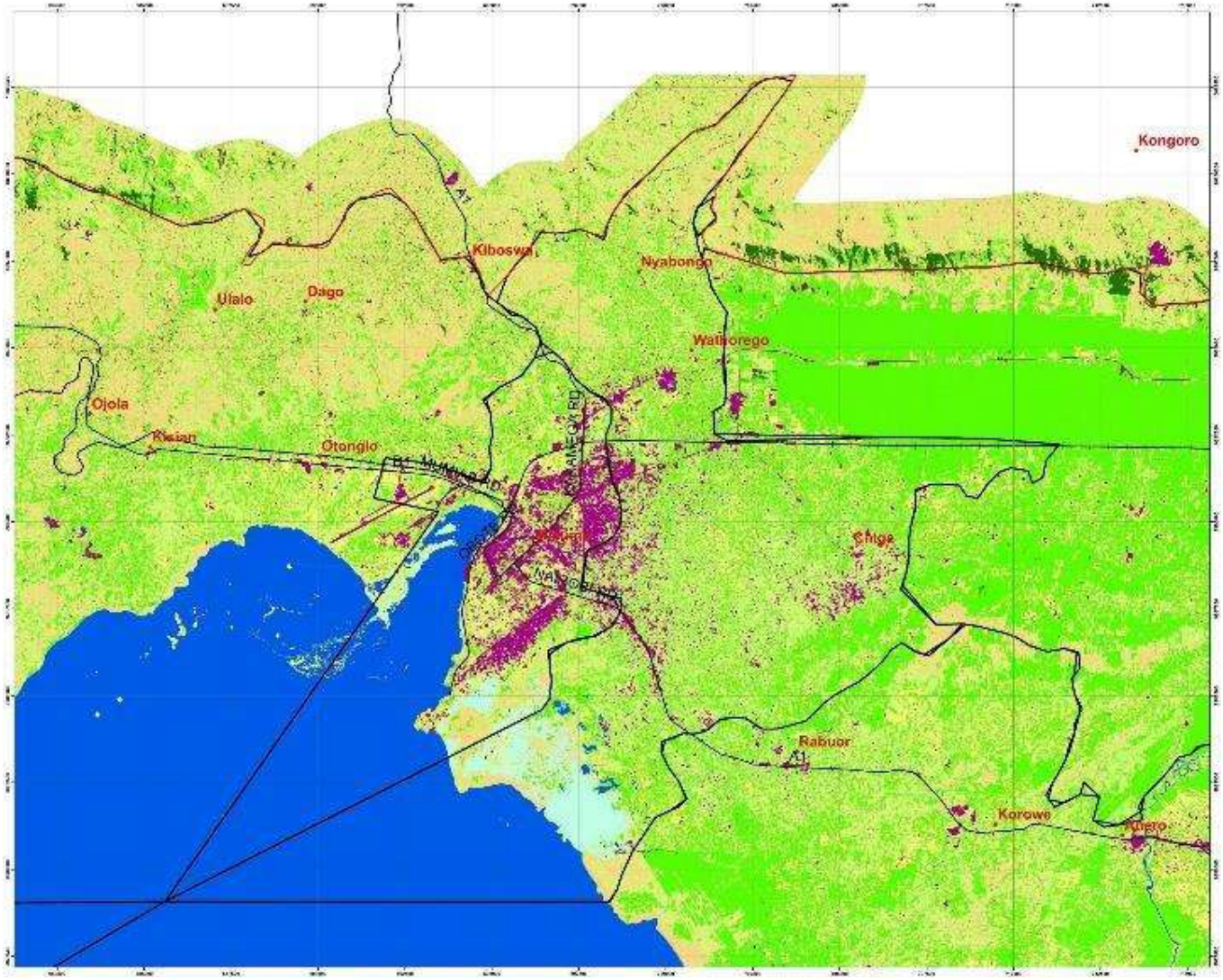
Figure 4-16: *Maize farming*

LAND USE AND LAND COVER OF KISUMU COUNTY - KISUMU CENTRAL SUB COUNTY



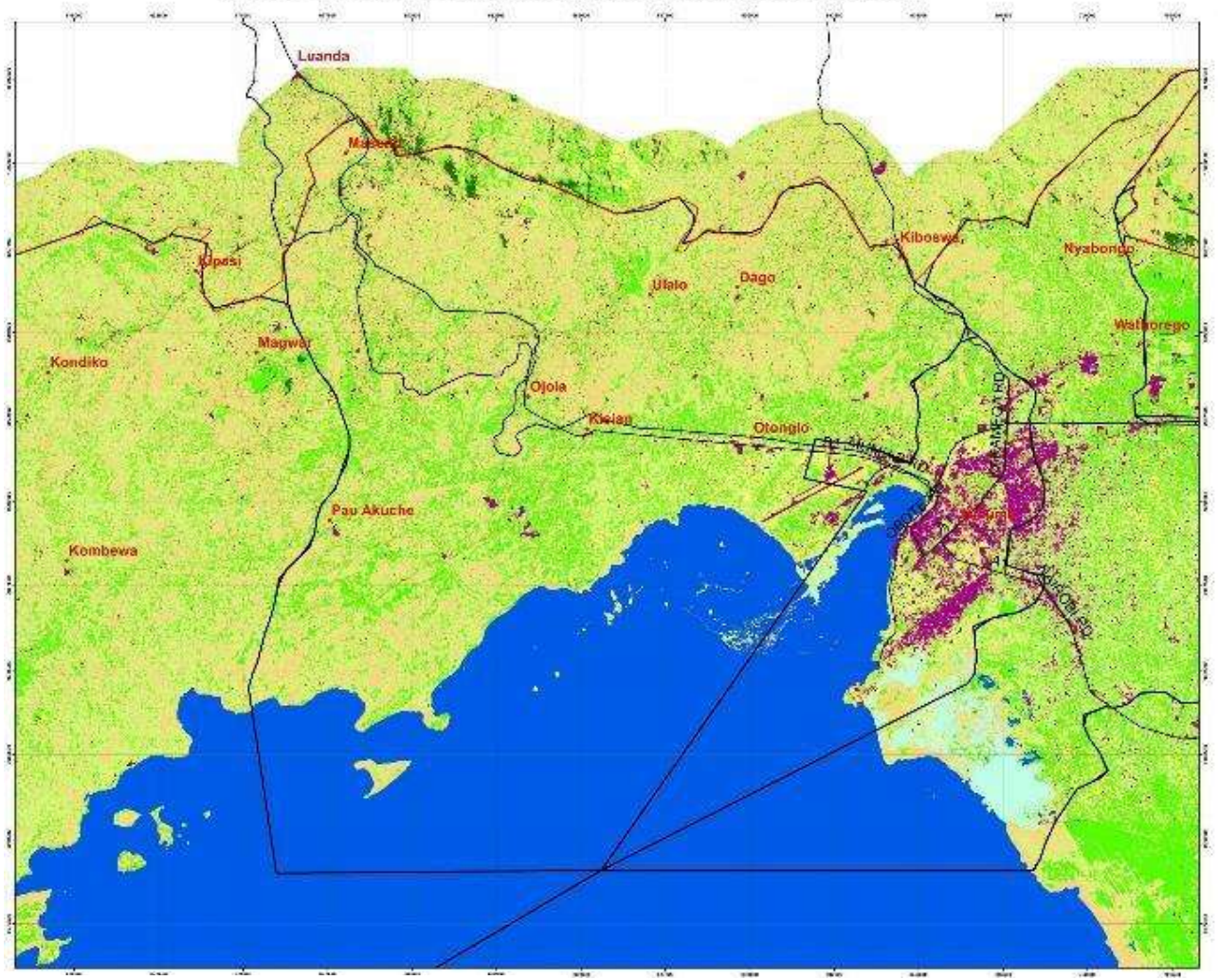
Source: GIS Limited

LAND USE AND LAND COVER OF KISUMU COUNTY - KISUMU EAST SUB COUNTY



Source: GIS Limited

LAND USE AND LAND COVER OF KISUMU COUNTY - KISUMU WEST SUB COUNTY



Source: GIS Limited

4.1.11. Major rivers and wetlands within the project AoI

Several key rivers traverse the Kisumu project area, each playing an essential role in the local ecosystem and supporting agriculture, wildlife, and human consumption.

- **Kibos River** flows through Kajulu and Guba areas, acting as a crucial water source for both domestic and agricultural use. This river requires careful monitoring during construction to prevent any potential contamination from project activities.
- **River Wigwa**, another significant watercourse in the region, flows near the Arina Estate. The river is sensitive to pollution and disruption, necessitating special measures to protect its waters from construction waste and runoff.
- **Nyamasaria River**, running close to Gudka Estate, serves as an essential water source for both residential and agricultural activities. This river, prone to seasonal flooding, requires attention to prevent siltation and debris accumulation during the excavation works.
- **River Awach** is also part of the hydrological network within the project AoI. The river supports agriculture and livestock in the adjacent areas. Careful management of stormwater and construction waste will be crucial to protect the river's water quality.

4.1.12. Disasters and risks related to climate Change

Kenya is in the Greater Horn of Africa region, which is highly vulnerable to the impacts of climate change. More than 80% of the country's landmass is arid and semi-arid land (ASAL) with poor infrastructure, and other developmental challenges. The main climate hazards include droughts and floods which have caused considerable losses across the country's different sectors over the years. Typically, major droughts occur approximately every ten years, and moderate droughts or floods every three to four years. Repeating patterns of floods and droughts in the country have had large socio-economic impacts and high economic costs. Floods affect water sector where pipelines are washed away and, cost of treatment is high due sediment load. Guba project area experiences moderate soil erosion and run off which in an extreme event can expose the buried water pipelines.

4.2. Biological Environment

Key ecological receptors and other valued environmental components (VECs) occurring within the project influence area (i.e., along or near the water networks) such as key biodiversity areas, rivers, and wetlands along the water networks are outlined below.

4.2.1. Forest & other Protected Areas within the project AoI

Kisumu region, specifically the areas around Arina Estate, Gudka Estate, Guba area in Kajulu, Milimani, and the CBD, is characterized by a mix of urban and semi-urban landscapes with patches of vegetation. The project area of influence (AoI) includes a variety of protected areas and green spaces. Kisumu Impala Sanctuary, located near Lake Victoria, serves as a critical conservation area within Kisumu. It is home to diverse flora and fauna, including impalas, zebras, and various bird species. The park's proximity to the project areas of Milimani and Dunga T. Works necessitates special consideration to minimize disruptions to the wildlife habitat, particularly during the nighttime construction phases.

4.2.2. Wildlife and bird migrations within Project AoI

The Kisumu region, particularly areas surrounding **Impala Park and Dunga Beach**, is a known migratory stop for various bird species, especially during the rainy season. The **Lake Victoria Basin** serves as a key corridor for bird migration, attracting both local and migratory species such as African fish eagles, pelicans, and ibises.

The conservation status of bird species is influenced by their migratory patterns and habitat requirements. Here's a detailed look at the conservation status of some key species:

Species	Conservation Status	Description	Threats
African Fish Eagle	Least Concern (IUCN Red List)	Widely distributed across sub-Saharan Africa, especially near large bodies of water.	Habitat loss, pollution, human disturbance
Great White Pelican	Least Concern (IUCN Red List)	Large water bird known for its distinctive beak and fishing abilities.	Habitat loss, disturbance at breeding sites, pollution
Pink-backed Pelican	Near Threatened (IUCN Red List)	Large water bird with distinctive pink and white plumage.	Habitat loss, disturbance at breeding sites, pollution
Sacred Ibis	Least Concern (IUCN Red List)	Wading bird with white plumage and black markings.	Habitat alteration, pollution
Hadada Ibis	Least Concern (IUCN Red List)	Wading bird recognized by its metallic green and purple sheen.	Habitat alteration, pollution

The timing of construction activities, especially during critical migration periods, will need to be carefully scheduled to avoid disruptions to birdlife. Nighttime work may mitigate some of the impacts on diurnal species, but it is essential to ensure that light and noise pollution are minimized to protect nocturnal wildlife.

Additionally, mammals like **hippos** occasionally roam near the shores of Lake Victoria, particularly in the wetlands adjacent to **Dunga**. While the project is designed to avoid direct interference with these animals, mitigation measures must be in place to prevent any accidental encounters, especially during the installation of pipelines.

4.2.3. Farmland vegetation characteristics within Project AoI

Agriculture remains a significant livelihood in areas such as **Kajulu and Guba**. These regions are characterized by small-scale subsistence farming, with vegetation dominated by maize, millet, sorghum, and cassava. The agricultural zones along the riverbanks of Kibos and Nyamasaria rivers are especially productive due to the fertile soils deposited by seasonal floods.

The vegetation in these areas must be protected from disruption during construction, particularly where pipelines cross farmland. In areas where old pipelines are being replaced or new ones installed, temporary access paths may need to be created to avoid damaging crops.

In **Arina Estate** and **Gudka**, residential areas are interspersed with gardens and small plots of farmland. These plots typically feature fruit trees, vegetables, and ornamental plants, contributing to the area's green landscape. Proper coordination with residents is necessary to minimize vegetation loss and ensure the community is involved in the reclamation and replanting efforts once the project concludes.

4.3. Bio –Physical Environment

4.3.1. Terrestrial Flora

The terrestrial vegetation in Kisumu primarily consists of grasslands, trees, and shrubs. The grasslands, once more extensive, have been reduced due to human activities, opening up land for agriculture and domestic animals. Despite this, significant portions of Kisumu's terrestrial flora remain preserved in protected areas such as Impala Park and Ndere Island National Park.

Key tree species identified in the region include the **Euphorbia tirucalli** and **Leea guineensis**, particularly in swampy areas like Guba. Woodlots around the port area feature a variety of native trees, contributing to the ecological balance. The Impala Park Sanctuary contains a diverse mix of trees, shrubs, and herbaceous plants that provide shelter and food for the local wildlife.



Figure 4-17: *Swampy Areas in Guba*

4.3.2. Terrestrial Fauna

Kisumu's terrestrial fauna includes a wide range of mammals, reptiles, and birds, with many species concentrated in protected areas such as Impala Park. Impala Park serves as a sanctuary for various species, including **leopards**, **hyenas**, **baboons**, **zebras**, and **giraffes**. Additionally, captive wildlife such as **ostriches**, **duikers**, and **warthogs** can be found within the park's-controlled environment. The surrounding grasslands and woodlands support smaller mammals such as rats, mice, and numerous other rodents. Birds, including grain-eating weaverbirds and other seed-eating species, are abundant in the region, taking advantage of the grassland ecosystem.

4.3.3. Aquatic flora and fauna

Kisumu's proximity to Lake Victoria significantly influences its aquatic ecosystems. The lake's wetlands and shorelines provide habitats for both aquatic plants and a diverse array of animal species. The aquatic vegetation includes **water hyacinth** and other macrophytes, which can have both positive and negative impacts on the lake's ecosystem.

Lake Victoria is home to a variety of fish species, including native **Tilapia escutenta** and **Tilapia variabilis**, as well as introduced species such as **Tilapia nilotica** and the predatory **Nile perch (Lates nilotica)**. Other notable aquatic species include **lungfish (Protopterus annecteus)**, **catfish (Clarius mozambicus)**, and **crocodiles (Crocodylus niloticus)**, which thrive in and around the lake.

Hippopotamus (Hippopotamus amphibius) are common in the lake, often residing in herds near the shores at locations such as Hippo Point and Dunga Beach. Their presence contributes to the ecological health of the lake, as their dung fertilizes aquatic plants like algae, which serve as food for various fish species. **Pythons** are also found in the lake's swampy areas, adding to the region's rich biodiversity.

4.4. Socio-Economic Environment

This Section provides secondary baseline socio-economic conditions of Kisumu County Population size

4.4.1. Demographic information

Kisumu County, with a population of 1,155,574 according to the 2019 census, exhibits a youthful demographic structure, with 43% of the population below the age of 15. This young population creates a high dependency ratio and places pressure on social services, such as education, health, and water supply. Population growth in Kisumu is driven by both natural growth and urbanization, particularly in Kisumu Central, which has a population density of 4,737 persons per square kilometer. The rapid urbanization in areas such as Kondele, Manyatta, and Nyalenda has led to informal settlements, where water and sanitation infrastructure is inadequate. The project must account for the needs of these rapidly growing urban areas and the associated strain on resources.

Table 8: Kisumu County Population

Demographic data	2009	Rank	2019	Rank
Population	968,909	12	1,155,574	13
Rural	464,587	32	714,668	22
Urban	504,322	6	440,906	7
Population distribution (2019 Census)	Cohorts	Female	Male	Total
	0-5	84,902	84,555	169,457
	6-14	142,606	141,195	283,801
	15-35	240,025	212,839	452,864
	36-60	92,885	96,509	189,394
	61+	34,176	25,832	60,008

Source: County Government of Kisumu

The Table below shows the most populous sub county is Kisumu East Sub County with a Population of 220,997 followed by Kisumu Central, Kisumu west, Nyando, Muhoroni, Nyakach and lastly Seme. This is reflected in the projections across the years of Implementation of the CIDP. It is also noted that the population of female is higher than for males in all the sub counties.

Table 9: Population Projections (by Sub-County and Sex)

Sub-county	Census (2019)	2022 (Projection)	Projection (2025)	Projection (2027)

	M	F	Inter-sex	T	M	F	T	M	F	T	M	F	T
Kisumu Central	84,155	89,985	5	174,145	91,726	93,267	184,993	96,031	98,354	194,386	98,796	101,587	200,402
Kisumu East	108,304	112,689	4	220,997	118,047	116,799	234,846	123,588	123,170	246,758	127,146	127,219	254,318
Kisumu West	85,697	87,121	3	172,821	93,406	90,299	183,705	97,791	95,224	193,015	100,606	98,354	198,878
Nyando	77,121	84,380	7	161,508	84,059	87,458	171,517	88,005	92,228	180,233	90,538	95,260	185,859
Nyakach	71,237	79,082	1	150,320	77,645	81,967	159,612	81,290	86,437	167,727	83,630	89,278	172,984
Muhoroni	76,770	77,345	1	154,116	83,676	80,166	163,842	87,604	84,539	172,143	90,126	87,318	177,353
Seme	57,658	64,007	2	121,667	62,845	66,342	129,187	65,795	69,960	135,755	67,689	72,260	140,011

Source: KNBS

Table 10: Population Projections by Age Cohort

Age Cohort	2019 (Census)			2022 (Projection)			2025 (Projection)			2027 (Projection)		
	M	F	T	M	F	T	M	F	T	M	F	T
0-4	70,200	70,870	141,070	76,083	76,170	152,253	75,853	74,999	150,852	75,188	74,365	**149,553**
5-9	73,732	73,933	147,665	72,548	74,222	146,770	74,014	77,074	151,088	73,917	76,284	**150,201**
10-14	81,818	82,705	164,523	69,892	71,363	141,255	70,044	71,731	141,775	71,044	73,627	**144,671**
15-19	66,211	68,693	134,904	67,731	68,350	136,081	68,484	70,631	139,115	68,640	70,910	**139,550**
20-24	51,057	61,983	113,040	63,519	63,059	126,578	65,737	65,933	131,670	66,282	67,492	**133,774**
25-29	44,356	52,430	96,786	58,536	58,136	116,672	60,282	59,391	119,673	61,792	61,337	**123,129**
30-34	42,146	48,152	90,298	51,545	50,710	102,255	55,838	55,622	111,460	57,048	56,523	**113,571**
35-39	33,546	29,237	62,783	42,482	41,637	84,119	46,841	45,723	92,564	49,679	48,982	**98,661**
40-44	27,219	23,924	51,143	33,502	32,874	66,376	37,627	37,235	74,862	40,482	39,946	**80,428**
45-49	18,030	16,384	34,414	23,873	23,929	47,802	28,897	28,178	57,075	31,570	31,028	**62,598**
50-54	13,022	14,459	27,481	14,411	14,970	29,381	18,854	19,478	38,332	22,019	22,201	**44,220**
55-59	11,174	13,958	25,132	9,564	10,509	20,073	10,133	10,925	21,058	12,856	13,766	**26,622**

60-64	9,552	12,144	21,696	8,266	8,937	17,203	7,783	9,225	17,008	8,166	9,534	**17,700**
65-69	7,294	9,273	16,567	6,677	7,124	13,801	6,818	7,809	14,627	6,632	8,021	**14,653**
70-74	5,733	7,035	12,768	5,460	5,949	11,409	4,836	5,858	10,694	4,993	6,296	**11,289**
75-79	2,611	4,040	6,651	3,438	3,937	7,375	3,979	5,093	9,072	3,773	5,068	**8,841**
80+	3,229	5,374	8,603	3,879	4,422	8,301	4,083	5,007	9,090	4,449	5,894	**10,343**
Age NS	**12**	**15**	**27**									

Source: KNBS

****Intersex population is excluded from the table since it is too small to be distributed by age***

4.4.2. Land-Use

Kisumu's land-use patterns are diverse, with a mix of residential, commercial, industrial, and agricultural activities. The city's industrial zones, such as the Kibos Industrial Area, house factories and processing plants, while large swathes of peri-urban land are under small-scale agriculture. However, rapid urban expansion has led to land-use conflicts, particularly in areas earmarked for public utilities, such as water pipelines and reservoirs. In some cases, planned water infrastructure projects have stalled due to land disputes or lack of access. The project must carefully navigate these land-use conflicts, ensuring that proper compensation mechanisms are in place for any land acquisition.

4.4.3. Status of Existing Water Resource Management Programs

Kisumu is part of the Lake Victoria Basin, which is Kenya's largest freshwater resource. The Lake Victoria South Water Works Development Agency (LVSWWDA) is responsible for water resource management in this region, focusing on watershed conservation, pollution control, and infrastructure development. Current water supply to Kisumu is drawn from the Dunga Water Treatment Plant, which relies on water from Lake Victoria. However, water resource management is challenged by pollution, encroachment on riparian zones, and declining water levels in the lake. The project must integrate with ongoing efforts to protect these critical water resources, including supporting the rehabilitation of degraded riparian areas and enhancing pollution control measures.

4.4.2. Community Structure

Kisumu's community structure is deeply rooted in the Luo culture, which places significant emphasis on communal living and traditional leadership. The Luo Council of Elders plays a pivotal role in decision-making processes, particularly in rural areas. This traditional leadership structure must be engaged throughout the project cycle to ensure community buy-in and address potential conflicts. Additionally, the project should consider the role of community-based organizations (CBOs) and non-governmental organizations (NGOs) that have been active in water and sanitation advocacy in the region, such as the Kisumu Water and Sanitation Company (KIWASCO). Collaboration with these groups will be essential for effective community engagement.

4.4.3. Employment

Unemployment in Kisumu stands at approximately 16.8%, with youth unemployment being particularly high. The primary employment sectors include agriculture (which employs 58% of the labour force), informal trade, and fishing. However, the decline of the fishing industry, due to overfishing and pollution in Lake Victoria, has left many without sustainable income. The water supply and sanitation project can create both direct and indirect employment opportunities. Direct employment will arise during the construction phase, which could prioritize hiring local labour, particularly unskilled and semi-skilled workers. Indirect employment opportunities could be generated through improved water supply, which would enable small businesses, such as laundries, car washes, and food vendors, to operate more effectively.

4.4.4. Gender

Gender inequality is pervasive in Kisumu, with women facing multiple barriers to economic participation and access to resources. Despite making up 51% of the population, women's labour force participation is lower than men's, with many women engaged in unpaid domestic work or small-scale informal businesses. Cultural norms also restrict women's ownership of land and access to credit. The project should adopt a gender-inclusive approach by ensuring that women are adequately represented in decision-making bodies, such as project steering committees. Specific interventions, such as training programs targeting women for employment in the construction and maintenance of water infrastructure, should be implemented to enhance their economic empowerment.

4.4.5. Local Communities

Local communities in Kisumu, particularly in peri-urban and rural areas, are highly dependent on natural resources for their livelihoods. Fishing, small-scale farming, and livestock rearing are common economic activities. The proposed project will significantly impact these communities by improving access to clean water, which is currently a major challenge in areas such as Nyamasaria and Otonglo. Currently, residents often rely on untreated water from rivers and streams, leading to high incidences of waterborne diseases, such as cholera and typhoid. By providing reliable access to treated water, the project will directly enhance community health outcomes and support local agricultural productivity, particularly in horticulture, which relies heavily on irrigation.

4.4.6. Livelihoods, Income Sources, and Distribution of Goods and Services

The economic structure of Kisumu is characterized by small-scale trading, subsistence farming, and informal sector activities. The central business district (CBD) and markets such as Kibuye and Jubilee serve as hubs for goods and services, while rural areas have limited access to formal markets. Improved water infrastructure will have a positive impact on livelihoods by reducing time spent fetching water, particularly for women and children, allowing them to engage in more productive activities. Additionally, reliable water supply will support the growth of small and medium enterprises (SMEs), particularly those in the food processing and hospitality sectors, which are currently constrained by irregular water access.

4.4.7. Recreation

Recreational activities in Kisumu are largely centered around Lake Victoria, with popular spots such as Dunga Beach, Hippo Point, and the Kisumu Impala Sanctuary attracting both locals and tourists. These areas are vital to the county's tourism sector, which has potential for

growth if properly managed. However, pollution from untreated sewage and industrial waste poses a significant threat to these recreational areas. The project must prioritize the construction of modern sanitation facilities and sewage treatment plants to prevent further pollution of Lake Victoria, thereby protecting these recreational sites and promoting sustainable tourism. Additionally, the creation of public green spaces and community parks as part of the urban water infrastructure could enhance recreational opportunities for residents.

4.4.8. Cultural Properties

Kisumu is rich in cultural heritage, with sites such as the Kit Mikayi rock formation and the Kisumu Museum being of significant historical and cultural value. These sites are not only important for cultural preservation but also serve as tourist attractions. The project must ensure that construction activities do not disrupt or damage any culturally significant properties. Conducting cultural impact assessments prior to construction and engaging with local cultural leaders will be essential in identifying and protecting these sites. Additionally, the project could integrate cultural elements into its design, such as using locally inspired architecture or incorporating public art that reflects the region's cultural heritage.

4.4.9. Education

Kisumu has a relatively high literacy rate of 83.1%, with a well-established network of educational institutions ranging from primary schools to tertiary institutions, including Maseno University and Kisumu Polytechnic. However, schools, particularly in rural areas, often face challenges related to inadequate water supply and sanitation facilities, leading to poor hygiene and health outcomes among students. The project should prioritize the provision of water and sanitation facilities in schools such as Arina primary and junior secondary school found in the upper part of Arina Estate, which will improve the learning environment and reduce absenteeism, particularly among girls who are disproportionately affected by poor sanitation. Educational programs focusing on water conservation and hygiene should also be integrated into the curriculum to promote sustainable water use practices among the youth.

4.4.10. Health

Kisumu faces significant public health challenges, with a high burden of communicable diseases such as malaria, HIV/AIDS, and waterborne diseases. According to the Kisumu County Health Department, the prevalence of waterborne diseases, such as cholera and diarrhoea, is particularly high in informal settlements and rural areas where access to clean water is limited. The project's impact on public health could be transformative by reducing the incidence of these diseases through improved water supply and sanitation. Collaboration with health facilities, such as Jaramogi Oginga Odinga Teaching and Referral Hospital, to promote hygiene education and water treatment practices will further enhance the project's positive health outcomes.

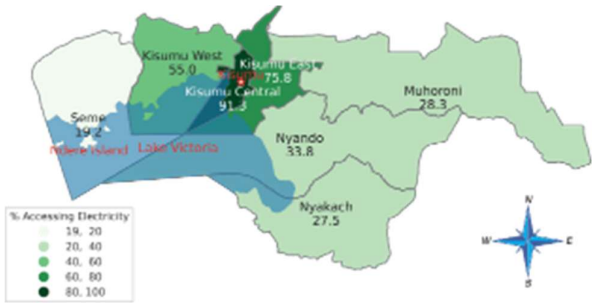
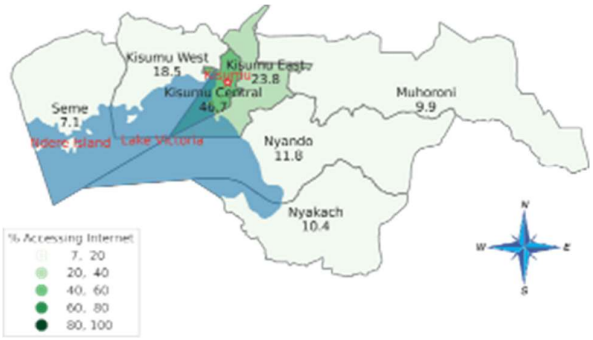
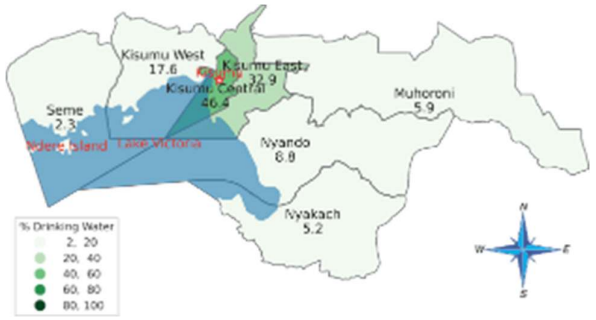
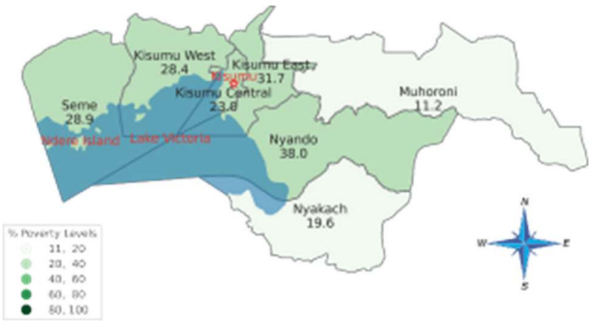
Table 11: Kisumu County Socio-economic indicators

Socio-economic outcomes				
Health				
Health outcomes	**2012/13**	**Rank**	**2019**	**Rank**
Child immunization (%)	57	28	96	15
People Living with HIV	113,000	3	144,303	3
Deliveries at health facility (%)	45.6	15	94.5	11
	2019		**Rank**	

Total Fertility Rate	3.2		30	
Infant Mortality Rate (Per 1,000 Live Births)	39.1		12	
Under five Mortality Rate (Per 1,000 Live Births)	63.1		11	
Maternal Mortality Rate (100,000 Live Births)	343		24	
	Male	**Rank**	**Female**	**Rank**
Life Expectancy at Birth (Years), 2019	54.0	44	63.1	29
Life Expectancy at 60 (Years), 2019	14.0	33	16.8	27
	2015/16		**Rank**	
Morbidity (sick/injured) (%)	26.6		10	
Health facilities (2020)	**Public**		**Private**	
No. of health facilities Level 5 / 6	1		0	
No. of health facilities Level 4	22		22	
No. of health facilities Level 3	50		4241	
No. of health facilities Level 2	73		112	
Health infrastructure and Personnel	**2019**		**Rank**	
Bed density per 10,000 population	17		14	
Health-workers per 10,000 population	23		7	
Health Expenditure	**2019**		**Rank**	
Average out of pocket outpatient expenditure (Ksh.)	2,212		14	
Average out of pocket inpatient expenditure (Ksh.)	644		10	
Health Insurance	**2015/16**		**Rank**	
Insurance coverage (%)	27.1		6	
Education				
Education Outcomes	**2009**	**Rank**	**2019**	**Rank**
Population with primary education (%)	56.9	23	49.3	36
Population with secondary education (%)	25.4	12	24.2	16
Population with complete Primary or Higher education (%)			77.7	14
Pre-Primary School Net Enrolment Rate (%)			85.3	5
Primary School Net Enrolment Rate (%)			84.0	19
Secondary School Net Enrolment Rate (%)			45.5	20
	2009	**Rank**	**2015/16**	**Rank**
Literacy levels (%)	65.8	30	90	20
School Outcomes	**2009**	**Rank**	**2015/16**	**Rank**
Primary school net attendance rates (%)	84	23	87.5	18
Secondary school net attendance rates (%)	27.3	14	36.6	21
School Infrastructure, 2019				
No of schools	**Public**		**Private**	
ECDE centres	657		550	
Primary schools	615		206	
Secondary schools	226		26	
No. of teachers	**Public**		**Private**	
ECDE centres	1,688		1,627	
Primary schools	6,174		1,554	
Secondary schools	2,895		288	
Pupils Teachers Ratio (PTR)	**Public**		**Private**	
ECDE centres	29		18	
Primary schools	41		21	
Secondary schools	31		11	
	2019		**Rank**	

Public Primary schools connected to electricity (%)	100		1	
Water & Sanitation	**2009**	**Rank**	**2019**	**Rank**
Households accessing safe drinking water (%)	54.8	20	72.9	9
Households accessing improved sanitation (%)	56.2	29	85.3	18
Energy	**2009**	**Rank**	**2019**	**Rank**
Households accessing electricity (%)	18.3	9	52.8	10
Roads	**2019**		**Rank**	
Rural Access Index (RAI)-%	90		9	
ICT	**2019**		**Rank**	
Population accessing internet (%)	20.5		8	
Population owning mobile phones (%)	49.4		17	

Table 12: Social services access rates and poverty levels

Households with access to electricity 2019 (%)	Population Accessing Internet 2019 (%)
	
Households Accessing Safe Drinking Water 2019 (%)	**Poverty Levels 2019 (%)**
	

4.4.11. Waste Disposal

Solid waste management is a critical issue in Kisumu, particularly in urban areas where waste collection services are limited. Kisumu City generates approximately 400 tonnes of solid waste per day, but only a fraction is collected and properly disposed of at the Kachok Dumpsite. Uncollected waste often ends up in water bodies, exacerbating pollution in Lake Victoria and clogging drainage systems, which leads to flooding. The project must incorporate sustainable waste disposal systems, including the implementation of an effective waste segregation program at the source to ensure recyclables and compostables are diverted from landfills. Developing partnerships with private waste management companies could also contribute to reducing the volume of waste and mitigating environmental impacts.

4.4.12. Community Participation, Customs, and Norms

In Kisumu, community participation in development projects is often hindered by a lack of awareness and mistrust of government initiatives. Traditional customs and norms, such as the involvement of elders in decision-making, must be respected to foster community buy-in. The project should adopt a participatory approach that engages community members at all stages,

from planning to implementation and monitoring. This includes conducting regular barazas (public meetings) to gather feedback and address concerns. Customary practices related to water use, such as communal access points, should also be considered in the project's design to ensure that it aligns with local norms and enhances community ownership of the infrastructure.

4.4.13. Traditional Knowledge, Perception, and Aspiration

Traditional knowledge systems in Kisumu, particularly among the Luo community, emphasize the sustainable use of natural resources, including water. These systems can provide valuable insights into water conservation practices, such as the protection of springs and rivers, which have been passed down through generations. The project should integrate traditional knowledge into its design and implementation, ensuring that local practices are respected and utilized. Understanding community perceptions and aspirations will also be key to the project's success. For instance, many residents aspire to have piped water and modern sanitation facilities, which should guide the prioritization of interventions.

4.4.14. Social Amenities and Infrastructure

Kisumu has seen significant improvements in infrastructure development, particularly in urban areas, where road networks, electricity, and telecommunication services have expanded. However, access to social amenities, such as health centers, schools, and markets, remains limited in rural areas. The project will play a crucial role in enhancing access to these amenities by improving water and sanitation infrastructure, particularly in underserved areas such as Kajulu. Integration with existing infrastructure development plans, such as the Kisumu Urban Project (KUP), will be essential to maximize the project's impact. For example, aligning water supply systems with road construction projects could reduce costs and improve service delivery.

4.5. Additional sewage

The planned overhaul of the water supply system will lead to increased water distribution and consumption. This, in turn, will have implications for the capacity of the existing sewerage system.

In Arina Estate, the sewerage system is already facing significant challenges due to its outdated and deteriorating condition. Residents have reported frequent blockages and inefficiencies, indicating that the current infrastructure is inadequate for the existing demands.

Similarly, Gudka Estate's sewerage system, characterized by its high population density, struggles with capacity issues, exacerbated by the area's dense housing. The situation in Lower Railways is not much better, with the old infrastructure contributing to inefficiencies and potential overloads.

The proposed improvements to the water supply are likely to increase overall water consumption in these areas. This rise in water use will result in a proportional increase in sewage output, placing additional strain on the already struggling sewerage infrastructure.

To address these challenges, a comprehensive assessment of the current sewerage system is necessary. This assessment should evaluate the condition of existing pipes, treatment facilities, and overall system design to identify any weaknesses. Based on this assessment, a capacity upgrade plan should be developed, focusing on replacing old and deteriorating pipes,

expanding sewage treatment facilities, and implementing improved maintenance procedures to prevent blockages and system failures.

It is crucial to integrate the sewerage system upgrades with the water supply overhaul project to ensure a cohesive approach. Coordination between the water supply and sewerage systems will help manage the increased demands effectively.

5. PUBLIC CONSULTATION, PARTICIPATION AND STAKEHOLDER ENGAGEMENT

5.1. Introduction

This chapter describes the process, and activities related to public consultation and stakeholder engagement that were undertaken to ensure that the relevant stakeholders and the public / community are informed about the project and are involved in the identification of key issues and impacts of the proposed project. Stakeholders are defined as persons or groups who are directly or indirectly affected by a project as well as those who may have interests in a project and / or the ability to influence its outcome, either positively or negatively.

Stakeholder engagement and public consultation are an integral aspect of successful decision making in the ESIA process and implementation of projects, plans and programmes. It is central to all other aspects of environmental and social performance. It is the basis for building strong, constructive and responsive relationships that are essential for the successful management of a project's environmental and social impacts (IFC, 2012). The key focus of meaningful consultations is equity and inclusivity i.e. ensuring that all groups (including those that are disadvantaged or vulnerable) are embraced within the consultation process on equal terms, and that all groups are given the capacity to express their views with the knowledge that these views will be properly considered.

The process of engagement presupposes that the relevant stakeholders and other interested publics have access to timely and accurate information on the environment and the proposed development and are therefore able to offer informed views on the project. Stakeholder engagement presents a useful avenue for gathering, understanding and establishing likely impacts of projects, determining community and individual preferences and selecting alternatives. For the proposed potable water networks project, stakeholder engagement focused on diverse issues including disclosure of project information, communication on project scope, financiers and financing framework, construction and operation impacts, mitigation measures, project benefits and recommendations.

The objectives of stakeholder engagement were.

(a) Share project information.

(b) Obtain feedback from the stakeholders.

(c) Bring the stakeholders up to date on the progress of the project as well as next steps to be undertaken.

(d) Garner support for the project hence acquiring the social license /acceptability.

(e) Reduce possibility of conflict through early identification of contentious issues.

(f) Understand culturally sensitive information about the stakeholders.

5.2. Consultation method and approach used in ESIA

Stakeholder mapping and analysis was undertaken in order to determine the particular stakeholders in the project area of influence (individuals, groups, communities, institutions/ organizations, agencies etc.) that will be affected directly or indirectly, either positively or negatively by the proposed project; or those who can contribute to, or hinder its success, and those with interests, have mandate over various issues related to the project. Overall, the critical guiding participation principles used are outlined below.

Table 13: Principles of Participation and how they were ensured in the ESIA process

Principle	How observed
Adaptive, communicative, meaningful and pro-active consultation	• Project information was shared in Swahili and English languages. In some cases where necessary translation was provided by a local person / someone appointed by the community or the chief. Some questions were however asked in Kiswahili, local language or English. • Information provided was extensive, detailed and providing as much information as possible but mainly revolving around dissemination of fundamental project background, objectives, scope, description of the proposed alignment, administrative footprint, potential positive and negative lenders, compensation entitlements, safety. • Effort was put towards simplification of technical processes and concepts.
Accessibility	• The locations for consultation were convenient to the stakeholders – in their offices or places where they live in the community. • Meeting venues were accessible to all those who wanted to attend; meetings were held within settlements, mainly in venues used for community meetings e.g. chiefs baraza, social halls, , open air, tents. • There were no restrictions for attendance.
Inclusivity	• All the stakeholders – men, women, youth, leaders, vulnerable peoples, households etc. were notified of the meetings and involved in the meetings. • Notices for meetings were posted well in advance, announcements were made in community gatherings. • Community mobilizers were used to reach more people.
Right to questions and responses	• In line with Article 33 of the Constitution, which states that public participation should respect the freedom of expression of the participants, the stakeholders were allowed to ask questions, share their views, make recommendations, seek clarifications, make comments about all aspects of the project. • All the questions, requests for clarifications, or additional information were responded to. • Time was dedicated to a question-response session in all the engagements.

Stakeholder engagement/participation was achieved through a variety of information and consultation methods. These were contextualized to the type of stakeholder and/or complexity of the information to be shared or collected. The consultation methods used were: community meetings, administration of a household questionnaire, key informant interviews, observation and secondary data.

Table 14: Consultation Methods

Stakeholder Type	Details of Stakeholders	Consultation Method
Community members in the project area	All community members: men, women, youth, vulnerable, PWDs,	• Environmental Impact Assessment questionnaire.

Stakeholder Type	Details of Stakeholders	Consultation Method
individuals / groups institutions that may or not be direct beneficiaries but who consider or perceive their interests in the project and the process of its implementation in some way.	community leaders, business people, religious leaders, traditional council of elders, village managers. • National Government County leaders e.g. Chiefs, Assistant Chiefs. • County Government Officers including Municipal Managers	• Community meetings. Barraza - notices of meetings were delivered to respective chiefs, Assistant Chiefs, village elders, Nyumba kumi elders, places of worship, markets, institutions. Announcements were made in public gatherings including places of worship, chiefs baraza, funerals, water collection points. • Face to face meetings. • One- on- One/ face to face meetings • Key Informant Interviews
Project Affected Persons (PAPs)	The PAPs were mainly the business owners who will be affected by the project during construction. The PAPs are within the Kisumu CBD, Arina areas and Milimani. This exercise was done during PAPs registration and valuation exercise.	• PAPs within the project areas were consulted through interviews using a structured questionnaire.
Government Agencies	• Kenya Wildlife Service (KWS) • NEMA • KURA/KERRA • CECM Water • CECM Roads • Water Resources Authority	• Key informant interviews • Face to face discussions • Questionnaire

Table 15: Key Stakeholders Consulted

Stakeholder	Relevance to the project components
National Government (Chiefs)	• Key implementer of government and public projects. • Safety of project staff and infrastructure. • Coordination and mobilization of the community and other stakeholders relevant to the project.
National Environment Management Authority (NEMA)	Review ESIA reports and issue EIA Licence
County Government	• Community Mobilization. • Implementer of County Projects. Therefore, liaison will be required for functions that fall under Kisumu County.
Kenya Wildlife Service	Some of the areas where the proposed project traverses have wildlife and wildlife corridors. Therefore, KWS is key agency to engage.
Water Resources Authority	Where the proposed project will traverse water catchment areas the agency was engaged.

Stakeholder	Relevance to the project components
Kenya Urban Roads Authority (KURA); Kenya Rural Roads Authority (KeRRA)	Some of the proposed water networks will have road crossings where the agencies were engaged.

5.3. Stakeholder Consultation and Engagement

5.3.1. Public community meetings (Barazas)

The Notices were distributed in the community, posted in public spaces including markets, places of worship, chiefs' offices, bus stops, social halls and shared with community members at random. The respective chiefs also made announcements of the planned meetings during their scheduled baraza meetings. A total of 3 community meetings were held in Arina Estate; Gudka Estate; and Guba area. Details of Minutes of Meetings and attendance list is placed at **Appendix- A, Appendix, & Appendix-B** respectively.

Objectives of community consultation meetings

i. To share and sensitize the community about the proposed project
ii. To obtain feedback from the community about the project.
iii. Promote community understanding of the issues and scope of the project with respect to the key project components.
iv. Learn how to work with the community to ensure that their concerns and aspirations are understood and considered in the ESIA report, and to assure them that their aspirations would be directly reflected in the report.
v. Empower the community to make them partners in every aspect / stage of decision making of the project
vi. Identify and establish a communication channel between the community, the consultants, project proponents and government.

Table 16: Venues, Date, Time, Attendance of Community Meetings

No	Location	Date	Time	Venue	Male	Female	Total
1.	Gudka Estate	2/8/2024	9am-12noon	Gudka Open ground	12	11	23
2.	Arina Estate	2/8/2024	2pm-5pm	Arina community hall	18	24	42
3.	Guba	3/8/2024	2pm-5pm	Guba open ground	38	21	59

5.3.2. Concerns/Issues/Questions raised during the Stakeholder Engagement

In all the engagements – both high level and community level, several issues were raised. The issues ranged between questions, comments and recommendations. The issues were synthesized / summarized below, and responses provided (for questions) as shown in the Table below.

Table 17: Question/Issue Response Matrix

No	Issue/Question Raised	Response Provided
1	There is a lack of water in the area. How will	The water infrastructure in the area is old and has led to frequent supply issues. The new project aims to replace the dilapidated

No	Issue/Question Raised	Response Provided
	residents benefit from the new project?	network with modern infrastructure, improving water reliability and quality. This will result in a more consistent and dependable water supply for the community.
2	What safety measures will be taken during and after the project?	Comprehensive safety measures will be implemented, including proper disposal of construction waste, water source protection, and dust control. Health and safety training will be mandatory for all personnel. Construction sites will be secured with barriers, and traffic control measures will be in place. Regular communication with the community will ensure that they are informed about progress and safety guidelines.
3	Will there be water rationing during the project?	There may be planned water supply interruptions during the project, but these will be scheduled and communicated in advance. Temporary water supply solutions, such as water tanks, will be provided to minimize inconvenience. Once the new infrastructure is in place, the need for water rationing should decrease, as the system will be better equipped to meet demand.
4	How long will the project take?	The project timeline is estimated at up to 12 months, depending on the area. Smaller areas may see completion within 4 months. Regular updates will be provided to the community.
5	How will meter theft be addressed?	The community is encouraged to protect their meter boxes by constructing secure chambers. The new system will include modern, tamper-resistant meters, reducing the likelihood of theft.
6	Why does it take so long to fix leakages, and will it be the same with the new project?	The current water system is old, making it difficult to locate and repair leaks. The new system will use durable materials that are more resistant to wear and tear, significantly reducing the frequency of leaks and improving response times for repairs.
7	How will the project ensure effective meter box installation?	Meter boxes will be installed in accessible locations at the front of properties to minimize disruption and ensure easy maintenance.
8	How will billing issues from previous tenants be handled?	It is the responsibility of landlords to ensure that water bills are cleared before new tenants move in. If issues arise, tenants are encouraged to contact the water utility office for assistance.
9	Will the new project guarantee clean water?	The project will use high-density polyethylene (HDPE) pipes, which are durable and resistant to leakage. This advanced material will help prevent contamination and ensure a reliable and clean water supply.
10	Who will cover the cost of damages caused during construction?	If damages occur during the project, they will be assessed, and the contractor will be responsible for covering the costs. Any damage to infrastructure, such as roads and pathways, will be reinstated to their original or better condition.

No	Issue/Question Raised	Response Provided
11	How will water bill management be improved to avoid inflated bills?	Customers are encouraged to monitor and pay their bills promptly. Utility companies will provide clearer communication regarding billing and offer support to resolve any disputes.
12	How will waste along meter lines be managed during the project?	Before initiating the overhaul of the water pipes, the areas affected by dumping will be assessed, and clean-up operations will be coordinated with local waste management authorities.
13	Will local youth benefit from employment opportunities?	The project will prioritize local labor, providing employment opportunities to youth in the community for various phases of the project. This initiative will also include skill development and training.
14	How will the new system address sewer blockages?	The upgraded system will include improved drainage to handle stormwater more efficiently and reduce the risk of blockages.
15	What is the purpose of the project, and how will it benefit residents?	The project aims to replace old and inefficient water infrastructure, reducing water loss and providing a more reliable and affordable water supply. The new system will address existing challenges, improving service to households and ensuring long-term water availability.
16	Will old meters be replaced?	Yes, old meters will be replaced with modern ones as part of the ongoing infrastructure renewal efforts.
17	Will the new system offer a token-based payment system like electricity?	The introduction of a token-based payment system is under consideration as part of a different pilot program. This system could offer a more flexible and convenient billing option for residents.
18	Is the project necessary?	The current water supply system is unreliable, with frequent service interruptions and significant water losses. Upgrading the infrastructure is essential to ensure consistent water availability and to reduce water losses, ultimately benefiting the community.
19	How will the project handle water supply disruptions during construction?	Construction will be phased to minimize disruptions, and temporary water solutions, such as tankers, will be provided if necessary. Residents will be notified in advance of planned interruptions, and efforts will be made to schedule work during off-peak hours.
20	How will waste be managed during pipe replacement?	Waste management protocols will include proper disposal of old pipes, separating recyclable materials, and handling hazardous waste safely. Regular site clean-ups will ensure that the environment remains safe and orderly throughout the project.
21	Can the water station be relocated to a more convenient location to reduce costs?	The feasibility of relocating the water station will be reviewed. If deemed viable, an updated environmental impact assessment (EIA) will be conducted to assess the impact of the relocation.

No	Issue/Question Raised	Response Provided
22	Will the project implement a flat rate billing system?	The current billing system will be analyzed, and the possibility of introducing a flat rate system in specific areas will be considered to address billing concerns.
23	How will population growth and water scarcity be addressed?	The project will expand the water supply infrastructure, including upgrading existing pipes and installing new ones, to enhance distribution capacity and meet the demands of a growing population.
24	Will the new water system alleviate the need for residents to queue for water?	Additional water points and storage facilities will be constructed to reduce wait times and improve access to water throughout the day, making it easier for residents to obtain water without lengthy queues.
25	Will local skills be utilized during the project?	The project will recommend that contractors hire local skilled workers and provide training opportunities to ensure that the community benefits from employment and skill development.
26	Will structures damaged during the project be compensated?	Thorough assessments will be conducted to identify any damages caused by the project. Appropriate compensation will be provided to affected parties based on these assessments.
27	How will the project minimize disruptions to local businesses during construction?	A detailed construction schedule will be developed, and communication with business owners will be prioritized to minimize the impact. Measures will be implemented to ensure efficient construction and reduce disruptions.
28	How will the project manage environmental impacts?	Measures will be implemented to protect water sources from contamination, prevent soil erosion, and manage dust. Regular monitoring will ensure that environmental impacts are minimized, and air and water quality remain within acceptable limits.
29	How will the long-term maintenance and sustainability of the new water infrastructure be ensured?	A maintenance plan will be established to ensure that the infrastructure is regularly serviced and remains functional. This plan will include scheduled inspections, preventive maintenance, and swift response to any issues that arise.

5.3.3. Summary of emerging issues presented during stakeholder engagement.

These issues have a strong bearing on the future activities and project implementation. These are:

- Consistent access to clean water was a primary concern across all stakeholders. The current infrastructure is aging, leading to frequent service interruptions, leakages, and poor water quality. There is a strong demand for the new infrastructure to address these concerns, ensuring reliability and improved water quality. The success of the project will depend on the careful design, construction, and ongoing maintenance of the new system.

- Safety during construction and environmental protection were significant concerns. Stakeholders emphasized the need for robust safety measures to protect both workers and residents, as well as strict protocols for managing construction waste, dust, and noise. The project will need to implement comprehensive health, safety, and environmental (HSE) guidelines. Ongoing community engagement will be essential to keep residents informed about potential hazards and mitigation measures.
- Stakeholders expressed concerns about possible water rationing and interruptions during the construction phase. While temporary disruptions are expected, there is anxiety over how long these will last and how they will impact daily life. To minimize the impact on residents, the project will need to ensure efficient communication about planned disruptions and provide alternative water sources, such as water tanks, during critical periods.
- The potential for local employment, particularly for youth, was a recurring topic. There is a strong desire for the project to provide economic opportunities for the community, including hiring local labor and offering training. The project must prioritize local hiring and skills development to build goodwill and ensure community support. This will also contribute to the long-term sustainability of the infrastructure by involving local expertise in its operation and maintenance.
- Concerns about water billing accuracy and the integrity of meter installations were raised, particularly regarding meter theft and inflated bills from previous tenants. There were also questions about the introduction of a token-based payment system similar to electricity. The project will need to implement a transparent and efficient billing system, alongside modern tamper-resistant metering technology. Clear communication about billing practices and the possible adoption of new payment systems will be essential to maintain trust with the community.
- Stakeholders were concerned about potential damage to property during construction, including roads, pathways, and personal property. They sought clarification on the compensation process and assurance that any damages would be addressed. A fair and transparent compensation process must be established, with proactive measures to minimize property damage. Continuous engagement with affected property owners will be critical to addressing grievances and maintaining community cooperation.
- Waste management, particularly along the meter lines and in areas affected by dumping, was highlighted as a concern. There is a need for proper disposal of construction waste and mitigation of any existing waste issues in the project areas. The project must collaborate with local authorities to address waste management challenges and ensure that construction waste is handled responsibly. This will contribute to the environmental sustainability of the project and improve community health outcomes.
- Stakeholders emphasized the importance of ensuring the long-term sustainability of the new water infrastructure. There were concerns about how maintenance would be handled and whether the system would be resilient to future challenges, including population growth. A detailed maintenance plan, including regular inspections, preventive measures, and community involvement in monitoring, will be critical to the project's long-term success. The infrastructure must be designed to accommodate future demand and changing environmental conditions.

- Several stakeholders raised concerns about the current state of the sewerage system and drainage, noting frequent blockages and inadequate handling of stormwater. The project will need to incorporate improvements to the sewerage and drainage systems to prevent blockages and flooding. This will be essential for both environmental health and community well-being.
- Continuous and effective communication with the community was identified as a crucial factor in the success of the project. Stakeholders emphasized the need for regular updates and transparent information sharing to manage expectations and address concerns. A robust community engagement strategy, including regular meetings, updates, and open lines of communication, will be necessary to ensure that stakeholders remain informed and supportive throughout the project lifecycle.

Selected photos of the public barazas



Figure 5-1: Public Baraza at Guba open ground



Figure 5-2: Public Baraza at Arina Estate



Figure 5-3: Public Baraza at Guba



Figure 5-4: Public Baraza at Arina Estate



Figure 5-5: Public Baraza at Guba



Figure 5-6: Public Baraza at Guba



Figure 5-7: Public Baraza at Guba



Figure 5-8: Public Baraza at Guba



Figure 5-9: Public Baraza at Gudka Estate



Figure 5-10: Public Baraza at Gudka Estate

5.4. Stakeholders' engagement during scoping phase

During the ground truthing process, project engaged relevant government authorities & elected representatives to brief them about the project.

5.4.1. Key informant interview with national and County government administration officers

The table below summarizes the key stakeholders consulted during the scoping phase.

Table 18: *Details of Stakeholder Engagement / Consultation undertaken for proposed water pipeline*

Date	Stakeholder	Venue	Key Points of Discussion and feedback
6/8/2024	KENHA	Regional Director's office	• Briefing on the proposed potable water networks. • The Regional Director pledged to support the project. • He raised concern that the proposed upgrade will maintain the current wayleave along A1 & Kisumu Southern Bypass Road, however, construction may affect transport operations, safety & road furniture. • The Regional Director also raised concern that pipeline construction at Guba may affect ongoing Mamboleo-Miwani-Chemelil road construction at Disciples of Mercy primary school and at Wathorego. • He said that they anticipate several impacts including Traffic snarl up; reduced visibility; damage of road furniture; accidents; interference with ongoing road construction of Mamboleo-Miwani-Chemelil road. • The Regional Director suggested that to mitigate the above negative impacts, the contractor should install warning signs on construction site; have flagmen/women to direct traffic when haulage trucks are bringing in pipes/equipment; avoid parking of haulage trucks along the road/road shoulders/road drainages; and consult with road contractor along Mamboleo-Miwani road to harmonize their operations.
5/8/2024	Water Resources Authority, Lake Victoria South Catchment	WQ&PCO Office	• Briefing on the proposed potable water networks. • WRA recommended that affected residents be advised to use other alternatives like borehole during the project period • WRA pledged to support the project
5/8/2024	CECM Water	Chief Officer's office	• Briefing on the proposed potable water networks. • The Chief Officer pledged to support the project.

Date	Stakeholder	Venue	Key Points of Discussion and feedback
			• The Chief Officer raised concern about reduced hours of water supply temporarily during replacement of the pipes. • The Chief Officer suggested that to avoid the negative impacts, campaign awareness, community/stakeholders sensitization, education and involvement be given priority.
6/8/2024	Municipal Manager, Kisumu County	Ward administrator's office	• Briefing on the proposed potable water networks. • The Ward administrator pledged to support the project. • The team requested for the community to be informed in time during implementation period.
29/07/2024	WSP (KIWASCO)		• Briefing on the proposed potable water networks. • **Existing Pipes**: KIWASCO will not remove old pipes, using the same easement instead. • **Phased Installation**: Connection will be done section by section to minimize disruptions. • **Work Schedule**: Proposed work will take place during night hours. • **Waste**: Materials will be harvested and used for other works. • **14-inch Line (PVC DN 650, 1.8 km): Challenges**: Old network unfamiliarity, rocky terrain, accessibility issues, service downtime, potential interconnection with other lines, and financing issues due to exchange rate fluctuations. • **9-inch Line (DN 250, 1 km)**: Road crossings (4 crossings), excavation depth of 1 meter, and the presence of asbestos lines which will not be removed. • **Arina Estate**: Challenges include spaghetti lines, areas with no water, and the need to reorganize existing lines. • **Kamaler Extension**: Challenges include lack of proper drainage and public encroachment. **Challenges:** • **Service Downtime**: Service interruptions during the project will incur overhead losses. • **Access Issues**: Accessibility, particularly in rocky areas, might delay the project. • **Spaghetti Lines**: Old, disorganized lines complicate installation. • **Public Encroachment**: Particularly along roads and storm drain areas.

Date	Stakeholder	Venue	Key Points of Discussion and feedback
			• **Complaint Handling**: KIWASCO has a customer care plan, including a WhatsApp group, social media, and a corporate complaints team. Notices will be issued 24 hours before major impacts.

5.4.2. Consultation with business and industry actors

Consultations were also conducted with business and industry actors along the proposed water pipeline route in Kisumu. The consultation process was essential in understanding the concerns, recommendations, and expectations of businesses located near the project area. A total of eight businesses were purposively sampled based on their proximity to the proposed project sites. These consultations aimed to identify potential impacts on local businesses and gather input on how to minimize disruptions during the construction phase.

Additionally, certain key organizations were not consulted. The project was deemed low-risk, and the consultation was limited to businesses directly along the project route. Given the localized impact, we did not deem it necessary to consult organizations with a broader regional focus. Including:

- Kenya National Chamber of Commerce and Industry (KNCCI) Kisumu Branch
- Kenya Association of Hotelkeepers and Caterers, Western Region

The following businesses were engaged during the consultation process:

1) Khetias Supermarket
2) Deli Energy
3) Sarova Imperial Hotel
4) KCB Bank
5) Madza Computers
6) Mazline Technologies
7) Clean Deal Accessories
8) Tivoli Centre

Businesses approached but no feedback received:

The following business were approached for one on one interview with the managers but declined due to their internal procedures in dealing with external matters.

1) Naivas Supermarket
2) Impala Park
3) Parkview Safari Lodge
4) Medspa Clinic
5) Hotel Mills View
6) Tafoam Mall
7) Jakmula Shopping Center

The feedback provided by the businesses highlighted both positive expectations and concerns regarding the implementation of the water pipeline project.

Issue/Question Raised	Analysis
Increased Water Supply	All consulted businesses agreed that the project would significantly improve the water supply to Kisumu, which would benefit their operations. Many businesses, especially those in hospitality and retail sectors, highlighted the importance of a reliable water supply for their day-to-day activities.
Work Schedule and Night Construction	Businesses strongly recommended that construction work be carried out during nighttime hours to minimize disruptions during business hours. Most businesses, especially Khetias Supermarket, Sarova Imperial Hotel, and KCB Bank, expressed concerns about daytime operations being affected by construction noise, dust, and restricted access.
Temporary Pathways and Access Bridges	Several businesses recommended the creation of temporary pathways and access bridges to ensure continuous access for customers and suppliers during the construction period. Businesses such as Clean Deal Accessories and Tivoli Centre emphasized that customer footfall is critical for their sales, and any hindrance to access would negatively affect their revenues.
Dust and Noise Pollution	Dust and noise were mentioned as key concerns. Businesses feared that construction activities would increase dust levels, affecting the cleanliness and appeal of their premises. Noise from construction equipment could also disturb the peaceful environment needed for banking and hospitality services. The businesses requested that mitigation measures such as regular watering to reduce dust and using quieter equipment where possible be implemented.
Concern Over Drop in Business	Most businesses, including Madza Computers and Mazline Technologies, expressed concerns about a potential drop in business due to construction-related disruptions. They requested that the project team actively communicate the timeline and mitigation measures to minimize uncertainty and ensure they can plan accordingly.
Project Timeframe	The businesses strongly recommended that the project timeframe be as short as possible to minimize the period of disruption. Some businesses, such as Deli Energy and Sarova Imperial Hotel, were particularly concerned that prolonged construction could lead to extended periods of inconvenience for their customers.
Employment Opportunities for Local Communities	Several businesses suggested that the project could offer employment opportunities for local residents, which would benefit the local economy. They emphasized the importance of involving local workers and suppliers in the project to create goodwill and support from the community.

6. PAPS DEMOGRAPHIC PROFILE AND REGISTER

6.1. Overview

The consultant carried out socio-economic survey and valuation for the loss of revenue for PAPs who will be affected by the project at Milimani, Kisumu CBD, Arina, Atunga Wathorego Market, Gudka and Lower railways residential estates.

6.2. Methodology

The data collection was done through structured survey questions, and interviews. A meeting was held on December 3, 2024 with KIWASCO team at KIWASCO office to discuss key issues and approach to be undertaken during PAP registration exercise. The team was tasked to guide the consultant during the survey.

Methods of Valuation

Income Method: The income method of valuation is a widely adopted approach in project evaluations, especially for assessing the financial impact of losses. This method determines the value of an asset or quantifies a loss by analyzing the income it generates or the income foregone due to disruptions. When daily income loss is used as the basis for compensation, this approach proves particularly effective for projects involving businesses, rental properties, or employment interruptions.

Concept and Application

The income method is based on the principle that the value of an asset or the compensation for a loss is intrinsically linked to its income-generating potential. In the context of a project causing temporary or permanent disruptions, this valuation approach involves estimating the daily income that would have been earned in the absence of the disruption. For instance, if a construction project necessitates the temporary closure of a business, the daily revenue or net profit the business would have generated serves as the foundation for determining the appropriate compensation.

Vulnerability Assistance

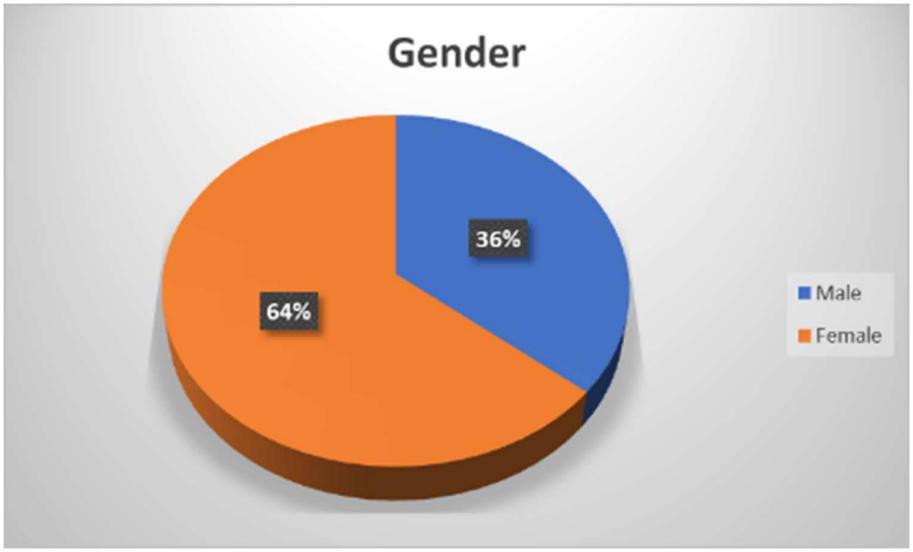
To determine the amount allocated for vulnerability, we adopted a systematic approach. First, the average daily revenue shortfall across all affected businesses was calculated. This figure was then rounded off to provide a standardized baseline for compensation. Recognizing the heightened challenges faced by vulnerable individuals and businesses, the baseline amount was doubled, resulting in a final allocation of KES 3,000.00. This approach ensured a fair and equitable acknowledgment of the additional hardships experienced due to the disruptions.

6.3. Socioeconomic and Demographic Profile

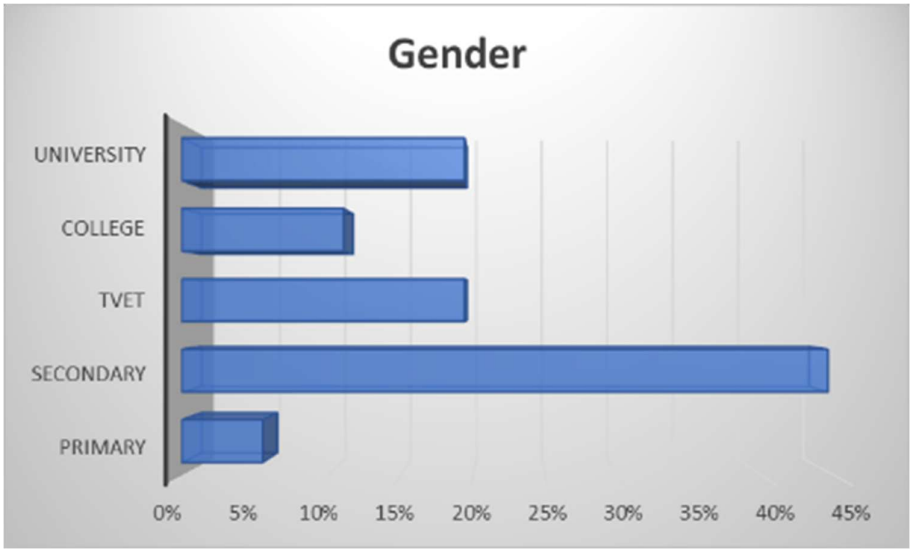
The socio-economic survey targeted all the PAPs identified during the PAP registration exercise.

6.3.1. Demographics

Gender: The data shows that 36% of the PAPs were male while 64% were female. This was an indicator that majority of the PAPs were female.

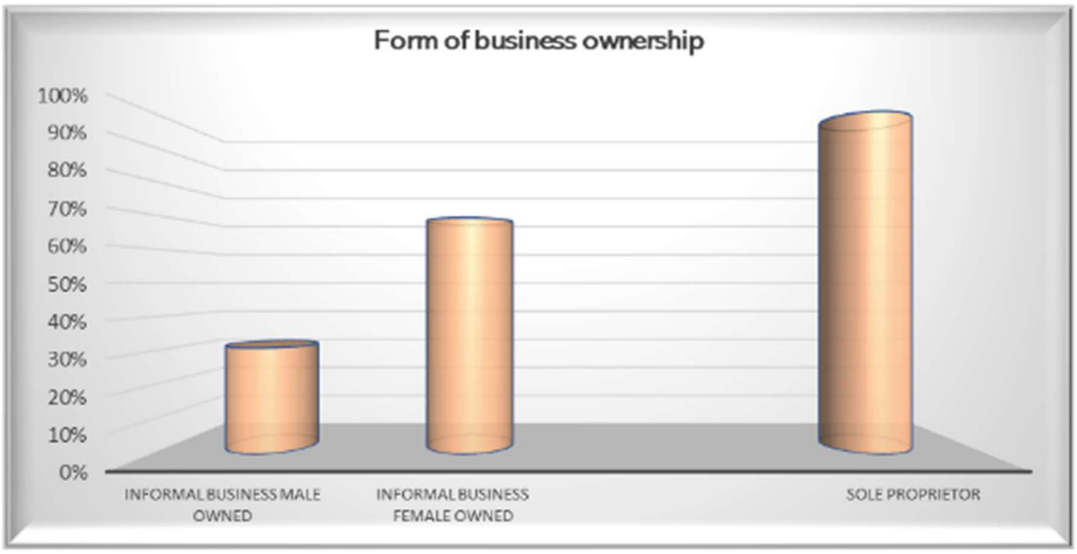


Level of education: As indicated in the graph below, majority (45%) of the PAPs had secondary education as their highest level of education, followed by those TVET (20%), and those with university education was 20%. This shows that the PAPs are in a position to read and write in English language.



6.3.2. Business ownership

The affected PAPs were business owners comprising of vendors, kiosks operators, shoe shiners among others. All the affected businesses are informal (have no legal registration documents). As shown in the graph below, the majority business ownership was female owned 69% while 31% is owned by male. Also, all the businesses were sole proprietorship.



6.4. Impact Assessment

From the assessment, 21No. PAPs will be affected during project implementation since they will be temporarily displaced resulting to loss of revenue. No structure will be affected. These are informal businesses comprising of flower vendor, general retail kiosk, shoe shiner, general open-air kiosk, shoe selling, watches and belts kiosks.

The valuation of the businesses were undertaken and PAPs register presented in appendix E of this report.

Also, there are businesses outside the wayleave but their access will be affected during the excavation works, namely:

1) Khetias Supermarket
2) Deli Energy
3) Sarova Imperial Hotel
4) KCB Bank
5) Madza Computers
6) Mazline Technologies
7) Clean De c veal Accessories
8) Tivoli Centre

These businesses are located within Kisumu CBD. The section to be affected is mainly pavement/cabro leading to these businesses which were constructed by the Kisumu municipal. During the PAP registration exercises, all these businesses were consulted through one on one interviews with managers. The consultant highlighted the nature of the project and the impacts. The following mitigation measures proposed by the KIWASCO were shared with the business owners:

- Scheduling construction to non-business hours e.g. at night and weekend with the provision of surveillance security to safeguard workers and properties.
- Ensuring timely reinstatement of affected access/ pavement
- Provision of alternative access routes/ paths for customers and suppliers.

6.5. Entitlement Framework

PAPs eligible for compensation:

- Businesses experiencing temporary physical and/or economic displacement.
- Owners or operators of businesses identified during the PAPs registration and asset inventory as 4th December 2024 are eligible for compensation. According to OP 4.12, cut-off date is the date the RAP census begins. The cut-off date is important because it guards against influx of people to the project area. Influx can increase the cost of compensation and need to be avoided. Persons who encroach on the area after the cut-off date are not entitled to any compensation package.

The entitlement matrix establishes the specific rights and entitlements to compensation or provision of compensation and assistance. These rights are granted to PAPs who will lose revenue due to temporary economic or physical displacement as determined during the PAPs registration survey.

Category	Compensation Type	Entitlement
Loss of revenue	Partial income compensation (**Daily business and workers income)**	Average daily income x + 15% disruption period. Add 15% Disturbance Allowance Add Support to Vulnerable PAP
Stock and Equipment Loss	Cash compensation	Replacement value
Utilities (Water/Electricity, internet fibre connection)	Cost of reconnection	Full reimbursement
Vulnerable Groups	Additional support	Livelihood restoration grants

6.6. Implementation Schedule

Activity	Timeline
Signing of Wayleave Agreement and Compensation Disbursement	Week 1 – Week 2
Restoration	Week 3 – Week 4
Monitoring and Evaluation	1 Month

6.7. Budget and Funding

The total budget for economic and or physical displacement compensation is **KES 93,898.39** inclusive of other costs such as disturbance allowance and grievance redress and administration. All costs associated with this RAP will be met by the KIWASCO.

Item	Cost Estimate (KES)
Compensation for loss of revenue	75,724.50
Administrative Costs (9%)	6,815.21
RAP implementation Monitoring and Evaluation audit (15%)	11,358.68
Total Estimated Budget	**93,898.39**

6.8. Monitoring and Evaluation Framework

- **Indicators:**
  - Number of PAPs compensated.
  - Percentage of pavement restored to pre-project level.
  - Number of grievances resolved within the timeframe.
- **Reporting:** Monthly updates and quarterly evaluations.

6.9. Conclusion and Recommendations

This RAP ensures a structured and equitable approach to mitigating economic impacts on businesses in Milimani, Kisumu CBD, Arina, Atunga Wathorego Market, Gudka and Lower railways areas. It is recommended that:

1. Compensation is disbursed promptly to avoid prolonged disruptions.
2. PAPs are continuously engaged during implementation.
3. Post-project evaluations are conducted to ensure long-term livelihood restoration.

6. PROJECT ALTERNATIVES

6.1. Section Overview

The purpose of this section of the ESIA is to examine feasible alternatives to the project and, highlight the benefits of and general rationale for the project that need to be considered against any potential environmental cost. The general principle involved in identifying option(s) to the proposed development is to ensure that the option chosen, which indeed may be the 'non development' option, would result in optimal returns in social and environmental capital: In effect the option chosen should bode well not only for the developer, but also for the environment and stakeholders in the area. This section is a requirement of the National Environment Management Authority (NEMA) and is critical in consideration of the ideal development with minimal environmental disturbance.

6.2. The "No-action" alternative

The "No Project" alternative would prevent immediate environmental disturbances, preserving existing ecosystems and biodiversity. Natural habitats and water bodies would remain undisturbed, and local communities would avoid the short-term negative impacts associated with construction activities, such as noise, dust, or potential displacement. However, this approach has significant drawbacks. By not proceeding with the project, the existing deficiencies in water supply would persist, potentially exacerbating issues like inadequate access to clean water. This could lead to increased environmental stress due to unsustainable local water use practices. Furthermore, the lack of improvement in water infrastructure would negatively impact the quality of life for local communities, limiting their access to clean and reliable water essential for health, economic development, and overall well-being.

The "No Project" alternative would involve continuing with the current water distribution system for the DN350mm and DN250mm main pipelines, as well as the water networks in the Arina, Gudka, and Lower Railways Estates. This would mean tolerating the existing high levels of Non-Revenue Water (NRW) due to physical losses such as leaks and bursts, leading to continued operational inefficiencies. The current NRW stands at approximately 38%, which significantly exceeds the national benchmark of 25%, resulting in financial losses of KES 112.7 million by Quarter 2, 2022. Without intervention, KIWASCO would continue to face these financial and operational challenges, including average service down-times of 7 hours per burst and high operation and maintenance (O&M) costs. Additionally, the deteriorating infrastructure in the Arina, Gudka, and Lower Railways Estates would continue to result in frequent service interruptions, leading to water losses of 44,760 cubic meters, with corresponding lost revenue of over KES 4 million. The "No Project" option fails to address these pressing issues and would hinder KIWASCO's ability to meet its key performance indicators (KPIs), including water coverage, drinking water quality, and hours of supply.

6.3. Project Design

An alternative design approach for the proposed potable water network overhaul would involve optimizing the size and material of the new pipelines to balance cost-effectiveness and durability. The current proposal suggests overhauling the DN350mm and DN250mm pipelines due to their inability to withstand transient flows during pumping, which has contributed to frequent bursts. An alternative design could involve the use of advanced pressure management systems could be incorporated to reduce the risk of bursts by maintaining

consistent pressure levels throughout the network. In the case of the Arina, Gudka, and Lower Railways Estates, the design alternative could involve using a combination of smaller diameter pipes, such as DN110, DN90, and DN63, which have been identified as optimal for distribution based on hydraulic calculations. These smaller pipes would ensure adequate water delivery while minimizing the risk of leaks and bursts due to high pressure. By adopting these alternative design elements, KIWASCO could reduce the frequency of service interruptions, lower O&M costs, and improve overall service delivery to the affected areas.

Choosing an alternative project design could potentially reduce environmental degradation by incorporating features like a smaller footprint or improved energy efficiency. This could minimize impacts on local ecosystems, especially if the design includes less invasive construction techniques or green technology. However, there are potential downsides to consider. New design features might introduce unforeseen environmental issues or technical challenges.

6.4. Location

Instead of overhauling the existing pipelines in their current locations, an alternative location strategy could involve rerouting the DN350mm and DN250mm pipelines along less congested routes to minimize the risk of external interference, such as damage caused by roadworks or erosion. For example, the current pipelines serving the Milimani, Nyalenda, Nyamasaria, and Central Business District (CBD) areas could be relocated to corridors with less heavy traffic and construction activity. Similarly, the water distribution networks in the Arina, Gudka, and Lower Railways Estates could be rerouted to avoid areas prone to frequent road construction and erosion issues. Relocating the pipelines to safer locations could reduce the likelihood of physical damage, which currently accounts for a significant portion of the 700 leaks and bursts experienced by KIWASCO each year. This strategy could also facilitate easier access for maintenance and repair activities, thereby reducing service down-times and operational costs. However, relocating pipelines would require careful planning to avoid disruptions to existing services and could likely involve additional land acquisition costs.

6.5. Layout

The alternative layout for the pipeline networks could involve reconfiguring the system to operate more efficiently by reducing interconnections and creating independent supply zones. In the current design, interconnections between the DN350mm and DN250mm pipelines result in widespread service interruptions whenever a burst occurs. By implementing an alternative layout that separates these pipelines into distinct zones, KIWASCO could reduce the number of customers affected by each service disruption. Additionally, the layout of the water distribution networks in the Arina, Gudka, and Lower Railways Estates could be optimized by incorporating more sectional valves and washouts to allow for better isolation of affected areas during maintenance activities. This would minimize the impact of leaks and bursts on the overall system and improve service reliability. The use of district metering areas (DMAs) in the alternative layout could also enhance KIWASCO’s ability to monitor water usage and detect leaks more effectively. This would lead to a more responsive system, capable of addressing issues before they escalate into major service interruptions.

6.6. Preferred /Selected Alternative

The preferred option is **Project Design with Advanced Pressure Management Systems and Optimized Pipeline Sizes**. This alternative offers the most balanced approach to addressing the key challenges of the water distribution network in Kisumu, particularly for the DN350mm and DN250mm pipelines and the Arina, Gudka, and Lower Railways Estates.

This design alternative proposes the use of advanced pressure management systems to regulate transient flows, reducing the likelihood of bursts that have historically caused frequent service interruptions. Additionally, incorporating smaller diameter pipes (DN110, DN90, and DN63) for the water distribution networks in these estates ensures that the system can operate at optimal capacity while minimizing the risk of high-pressure failures. The smaller pipes, designed based on hydraulic calculations, will provide a more resilient water delivery system, reducing the operational costs associated with repairs and maintenance.

Key benefits of this alternative include:

- **Enhanced system reliability**: Pressure management systems reduce the risk of bursts, ensuring fewer interruptions in water supply, which directly improves service delivery for residents.
- **Cost efficiency**: Smaller diameter pipes and advanced design choices reduce both operational and maintenance costs, minimizing water loss and improving the financial sustainability of the water supply network.
- **Environmental sustainability**: By avoiding the need for large-scale infrastructure in sensitive areas, this option limits the project's environmental footprint while still enhancing the water infrastructure.

Although this design alternative may involve higher upfront investment costs due to the incorporation of advanced technology, its long-term benefits in terms of system reliability, reduced water loss, and overall service improvement make it the most viable solution. This approach also aligns with KIWASCO's objectives of meeting key performance indicators (KPIs) for water coverage, drinking water quality, and minimizing NRW, which currently stands at 38%.

Additionally, this option avoids the significant financial and operational drawbacks associated with the "No Project" alternative, which would perpetuate existing inefficiencies and lead to continued water loss and service interruptions. It also mitigates the challenges of relocating pipelines and reconfiguring the layout, both of which pose additional risks and costs without offering substantial improvements in service delivery.

7. PROJECT POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS AND MITIGATION MEASURES

7.1. Overview

This chapter presents the assessment of the issues likely to emanate from implementation of the proposed project and associated infrastructure. For each issue, the analysis is based on its nature, the predicted impact, extent, duration, intensity, probability, and the stakeholders and/or values affected. In accordance with best practice, the analysis includes issues relating to the project's environmental and social sustainability. For potential negative impacts judged to be significant and require mitigation, the analysis is followed by notes on mitigation options. Impacts and their possible mitigation are combined in this chapter for easy reference. As in most impact studies, the analyses focus on potential problems and their solutions.

7.2. Impact identification

7.2.1. Sources of impacts

The impacts associated with the proposed project will emanate from project inputs, activities and outputs. The project inputs that shall be potential sources of impacts include materials taken from local and external sources including sand and cement; skilled and unskilled workforce exerting indirect demand for water supply, sanitation, health services etc; and machinery used at the project site for various activities. The project activities that shall be potential sources of impacts include obtaining raw materials e.g. transportation of raw materials, machinery and labour to the site; site preparation and clearance; topsoil removal; demolition works (for structures located along project alignment areas); excavation works; disposal of excavated materials; backfilling works and compaction. Project outputs likely to lead to adverse impacts include solid wastes from construction and operation activities; emissions from the site (hydrocarbons, Carbon dioxide, and particulate matter); noise pollution from construction activities and hazardous waste (oil) spillage

Table 19: Sources of impacts

Project Inputs	Project Activities	Project Outputs
• Materials taken from local and external sources • Skilled and unskilled workforce • Machinery used at the project site	• Transportation of raw materials • Transportation of machinery • Transportation of labour • Site clearance • Excavation works • Spoil and waste disposal • Backfilling and compaction	• Waste generated • Gaseous emissions from the site • Noise from site activities • Oil spills

7.2.2. Receptors of impacts

The anticipated negative impacts will be experienced on both the physical and human environments. Human environment likely to be affected by project activities include structures within project vicinity and alignment areas; residential premises within project vicinity; businesses within project vicinity and workers at the site. Natural environment likely to be affected by project activities include surface and ground water resources within the vicinity of the project and air quality within the project area.

Table 20: Receptors of impacts

Human Environment	Physical Environment
• Residential houses within project vicinity • Business premises within project vicinity • Academic institutions including schools • Workers at the site	• Surface water resources • Ground water resources • Plants and animals within project alignment area • Ecologically sensitive areas • Soil

7.2.3. Impact Assessment Criteria

The criteria applied in this study are based on industry standards for impact assessment, adopted for use in the assessment of the proposed project impacts. The purpose of impact assessment is to assign relative significance to predicted impacts associated with the project, and to determine the way impacts are to be avoided, mitigated or managed. The rating of impacts assumes that standard construction and operating procedures present in the project description will be implemented. The impact assessment criteria include the spatial context of project impacts; temporal context; and reversibility, magnitude and significance of potential impacts of project construction and operation. The potentially significant environmental and social impacts have been identified based on the nature of the receiving environment, analysis of the proposed activities and analysis of the issues raised by stakeholders during public participation process.

7.3. Impact Assessment Methodology

7.3.1. General

In the impact assessment stage of the ESIA, identified issues are analysed and expected impacts are defined. This analysis identifies the types of impact; predicts the magnitude, probability of occurrence and extent of the impact; and determines the overall significance of the impact

7.3.2. Identification of environmental aspects and impacts

The outstanding environmental and social issues identified as having significance have been assessed using the following methodology.

(i) First, the issues identified were described considering the associated activity and the aspect of that activity that is likely to result into an impact.
(ii) The nature of the impact was then described.
(iii) Once this was undertaken, the significance of the impact was determined.

The following definitions have been used in identification of environmental and social impacts in this study:

(i) An activity

This is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation.

(ii) An environmental aspect

This is an "element of an organisation's activities, products and services which can interact with the environment". The interaction of an aspect with the environment may result in an impact.

(iii) Environmental impacts

These are the consequences of these aspects on environmental resources or receptors of value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. Receptors can comprise, but are not limited to, people or human-made systems, such as residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and palaeontology. Impacts on the environment can lead to changes in existing conditions; the impacts can be direct, indirect or cumulative. Direct impacts refer to changes in environmental components that result from direct cause-effect consequences of interactions between the environment and project activities. Indirect impacts result from cause-effect consequences of interactions between the environment and direct impacts. Cumulative impacts refer to the accumulation of changes to the environment caused by human activities.

Aspects and impacts associated with the proposed development have been differentiated into construction and operation phases of the project.

7.3.3. Description of aspects and impacts

The accumulated knowledge and the findings of the environmental investigations form the basis for the prediction of impacts. Once a potential impact has been determined during screening and scoping process, it is necessary to identify which project activity will cause the impact, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies and has been used in this study. The aspects and impacts identified have been described based on the following criteria.

7.3.4. Spatial scope

The spatial scope for each aspect, receptor and impact has been defined. The geographical coverage (spatial scope) description has taken account of the following factors:

- The physical extent/distribution of the aspect, receptor and the anticipated impact; and
- The nature of the baseline environment within the area of impact.

The spatial scope of the impact has been rated on the following scale:

Activity specific	1	Area specific	2	Whole site	3	Regional/ neighbouring areas	4	National	5

7.3.5. Duration

Duration refers to the length of time that the aspect may cause a change either positively or negatively on the environment. The environmental assessment has distinguished between different time periods by assigning a rating to duration based on the following scale:

One day to one month	1	One month to one year	2	One year to ten years	3	Life of operation	4	Post closure	5

7.3.6. Severity

The severity of environmental aspect has been determined by the degree of change to the baseline environment, and has included consideration of the following factors:

(i) The reversibility of the impact.
(ii) The sensitivity of the receptor to the stressor.
(iii) The impact duration, its permanency and whether it increases or decreases with time.
(iv) Whether the aspect is controversial or would set a precedent; and
(v) The threat to environmental and health standards and objectives.

The following ratings have been used

Insignificant/ non-harmful	1	Small/ potentially harmful	2	Significant/ slightly harmful	3	Great/ harmful	4	Disastrous/ extremely harmful	5

7.3.7. Frequency of Activity

Frequency of activity has considered the repetitiveness of various project activities and how this may impact on the various receptors of the impacts. The following ratings have been used

Annually or less	1	6 monthly	2	Monthly	3	Weekly	4	Daily	5

7.3.8. Frequency of the impact

The frequency of the impact occurring refers to how often the aspect impacts or may impact either positively or negatively on the environment. After describing the frequency, the findings have been indicated on the following scale:

Almost never/	1	Very	2	Infrequent/	3	Often/	4	Daily/highly	5

almost impossible		seldom/ highly unlikely		unlikely/ seldom		regularly/ likely/ possible		likely/ definitely	

7.4. Assessment of significance of impacts

7.4.1. General

The purpose of impact evaluation is to assign relative significance to predicted impacts associated with the project, and to determine the way impacts are to be avoided, mitigated or managed. The information presented above in terms of identifying and describing the aspects and impacts have been summarised in a tabular form and significance has been assigned with supporting rationale. Significance has been determined before and after mitigation, taking into consideration all the factors described above. A definition of a "significant impact" for the purposes of this study is: "An impact which, either in isolation or in combination with others, could, in the opinion of the specialist, have a material influence on the decision-making process, including the specification of mitigating measures."

7.4.2. Significance determination

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which has already been assessed by the relevant specialist. The description and assessment of the aspects and impacts undertaken is presented in a consolidated table (Table 7.2) with the significance of the impact assigned using the process and matrix detailed below. The sum of the first three criteria (spatial scope, duration and severity) provides a collective score for the CONSEQUENCE of each impact. The sum of the last two criteria (frequency of activity and frequency of impact) determines the LIKELIHOOD of the impact occurring. The product of CONSEQUENCE and LIKELIHOOD leads to the assessment of the SIGNIFICANCE of the impact, shown in the significance matrix below.

Table 21: Significance Assessment Matrix

CONSEQUENCE (Severity + Spatial Scope + Duration)															
LIKELIHOOD (Frequency of activity + Frequency of impact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 22: Positive and Negative Mitigation Ratings

Colour Code	Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
	Very high	126-150	Improve current management	Maintain current management
	High	101-125	Improve current management	Maintain current management
	Medium-high	76-100	Improve current management	Maintain current management
	Medium-low	51-75	Maintain current management	Improve current management
	Low	26-50	Maintain current management	Improve current management
	Very-low	1-25	Maintain current management	Improve current management

The model outcome is then assessed in terms of impact certainty and consideration of available information. Where a particular variable rationally requires weighting or an additional variable requires consideration, the model outcome is adjusted accordingly. Arguments for such adjustments are presented in the text and associated table.

Table 23: Framework for Assessing Environmental Impacts

Spatial Scope	Rating	Duration	Rating	Severity	Rating
Activity specific	1	One day to one month	1	Insignificant/ non-harmful	1
Area specific	2	One month to one year	2	Small/ potentially harmful	2
Whole site / plant	3	One year to ten years	3	Significant/ slightly harmful	3
Regional (neighbouring areas)	4	Life of operation	4	Great/harmful	4
National	5	Permanent	5	Disastrous/ extremely harmful	5

FREQUENCY OF ACTIVITY	RATING	FREQUENCY OF IMPACT	RATING
Annually or less	1	Almost never / almost impossible	1
6 monthly	2	Very seldom / highly unlikely	2
Monthly	3	Infrequent / unlikely / seldom	3
Weekly	4	Often / regularly / likely / possible	4
Daily	5	Daily / highly likely / definitely	5

SIGNIFICANCE OF IMPACT	TIMING
Very Low (1-25) Low (26-50) Medium -Low (51-75) Medium-High (76-100)	Pre-construction Construction Operation

High (101-125) Very High (126-150)	

7.5. Description of Feasible Alternatives

Although alternatives were investigated in detail during screening and scoping process, a review of the options based on the impact assessment have been undertaken in comparison with the preferred option.

7.6. Mitigation

Measures to avoid, reduce or manage impacts consistent with best practice have been proposed and the effectiveness of such measures assessed in terms of their ability to avoid, remove an impact entirely, render it insignificant or reduce its magnitude. In assessing the significance of the impact, natural and existing mitigation have been taken into account. Natural and existing mitigation measures are defined as natural conditions, conditions inherent in the project design and existing management measures that alleviate (control, moderate or curb) impacts. In addition, the significance of impacts has been assessed considering any mitigation measures that are proposed.

7.7. Existing environmental and social impacts

The environmental and social impacts of the projects are closely interlinked due to the common objective of addressing deteriorating water networks and improving water service delivery in Kisumu. The existing water supply systems in these areas are plagued by high incidences of leaks, bursts, and NRW losses, leading to significant environmental degradation and social inconveniences.

In the DN350mm and DN250mm distribution main overhaul, the key environmental challenge stems from the frequent bursts and leaks, which result in substantial water loss. These water losses exacerbate the strain on Kisumu's already scarce water resources, contributing to a reduction in water availability for both residential and commercial consumers. The physical damage to pipelines, often caused by external interference such as erosion and roadworks, further compounds the environmental impact. The intermittent water supply caused by these dilapidated networks not only disrupts water access but also leads to over-extraction of water from natural sources as KIWASCO attempts to compensate for the losses. Additionally, the repair and replacement activities generate construction waste and necessitate the use of materials that could further strain local ecosystems if not managed properly.

From a social perspective, the frequent water supply interruptions have a significant impact on the daily lives of Kisumu residents, particularly in the Central Business District (CBD) and the densely populated areas of Milimani, Nyalenda, and Nyamasaria. The average service downtime of seven hours per burst creates hardship for households, businesses, and institutions reliant on consistent water access. The prolonged downtime and the high number of bursts—averaging three per pipeline per month—indicate a critical need for infrastructural upgrades to meet the demands of a growing urban population. Furthermore, the interconnections between the pipelines exacerbate the social impact, as a burst in one

line often leads to disruptions in adjacent lines, increasing the number of affected customers.

The environmental and social challenges observed in the Arina, Gudka, and Lower Railways estates are similar, with a particular emphasis on the degradation of old metallic pipes that are prone to clogging, brittleness, and frequent leaks. The outdated networks in these estates not only cause extensive water losses, estimated at over 44,760 cubic meters during the review period but also contribute to environmental degradation through water pollution and soil erosion. As with the DN350mm and DN250mm mains, the water loss and subsequent over-extraction of water from treatment facilities place unsustainable demands on natural water resources. In addition, the leaks often result in localized flooding, which can cause soil erosion and damage to adjacent infrastructure, further intensifying the environmental consequences.

Socially, the frequent supply failures in these estates affect a substantial number of consumers, with 832 connections serving a population that relies heavily on regular water access for domestic and commercial activities. The social cost of the intermittent supply is considerable, particularly given that these estates, such as Arina and Lower Railways, serve economically vulnerable populations that may not have the resources to cope with prolonged water outages. The operational and maintenance costs associated with repairing the leaks and bursts in these areas, which totaled approximately KES 3,996,000, underscore the financial burden on KIWASCO and, by extension, on the communities that depend on these water networks.

Issues noted within the project area that may adversely impact the proposed project implementation include the following:

7.7.1. Encroachment of road reserve by development facilities

Road reserves within the project area have been encroached by private developers. Several business enterprises have been erected within road reserves. These businesses include second hand cloth stores, food kiosks, retail shops and workshops. Some of the businesses are constructed of permanent materials while others are constructed of temporary materials. This has led to a situation where the roads have become narrower, and this may pose challenges during implementing public works.



Figure 7-1: Businesses along the road reserve in Arina Estate

7.7.2. Encroachment of water pipeline way leaves

It was noted that some structures have been constructed on the path of water pipelines. This makes it difficult to respond to emergencies like leakages and bursts. Carrying out line maintenance activities also becomes a challenge under these circumstances.

7.7.3. Inherited Old Networks

KIWASCO has inherited outdated and dilapidated water networks, particularly in the Milimani and CBD areas. These old systems are unfamiliar to the current team, making it difficult to conduct a comprehensive assessment and accurately predict potential issues. This lack of familiarity could lead to delays in project timelines as additional inspections, tests, and adjustments may be needed to ensure a smooth overhaul.

- **Mitigation**:
    - Conduct comprehensive mapping and documentation of the existing infrastructure using Geographic Information Systems (GIS).
    - Engage experienced personnel familiar with legacy systems to provide insights and support during the overhaul.
    - Ensure all records of previous installations and maintenance activities are digitized for easy reference and use in the overhaul.

7.7.4. Rocky Terrain and Time Implications

The project site, particularly along the Kamaler-Guba route, features very rocky terrain. Excavation in such areas is more time-consuming and requires specialized equipment. Additionally, rocky soil conditions increase the likelihood of encountering hard-to-remove obstacles that can delay progress.

Mitigation:

- Conduct a detailed geotechnical survey to identify rocky sections and adjust project timelines accordingly.

- Use advanced excavation techniques such as hydraulic hammers or controlled blasting to expedite rock removal while minimizing environmental impact.
- Allocate additional time buffers in the project schedule for unforeseen delays due to challenging terrain.

7.7.5. Accessibility and Potential Conflicts

Access to certain parts of the project area, especially where there are public encroachments along the lower sections of the highway, may bring conflict. Public encroachment often leads to disputes during infrastructure upgrades as residents resist displacement or disruption.

Mitigation:

- Engage with local stakeholders through public participation meetings to discuss access routes and secure community support.
- Establish clear communication channels with residents to address concerns promptly and mitigate potential conflicts.
- Provide alternative access routes during the construction period to minimize disruptions to daily activities in affected areas.

7.7.6. Interconnection with Other Lines

The existing networks are interconnected, and during the overhaul, it may be challenging to disconnect them without causing disruptions in other parts of the system. Additionally, some parts of the network, such as "spaghetti lines" that have been disabled, may still pose challenges when reconfiguring the new systems.

Mitigation:

- Conduct a detailed survey to identify all existing interconnections and disconnect non-essential or redundant connections.
- Create independent operational zones by installing sectional valves and ensuring proper isolation of networks during maintenance or overhaul activities.

7.7.7. Possibility of Illegal Tapping

As the water networks are transmission lines, there is a possibility that individuals may attempt to tap into the lines illegally during or after the project. Illegal tapping not only reduces revenue but also compromises water quality and safety.

Mitigation:

- Install tamper-proof valves and smart metering technology along the transmission line to monitor unauthorized use.
- Increase surveillance and patrols along the line, particularly in areas prone to illegal connections.
- Implement public awareness campaigns about the legal implications and penalties for illegal tapping.

7.7.8. Road Crossings

The 9-inch DN250 pipeline in the CBD/Milimani area presents challenges due to road crossings. There are four major crossings that require careful planning and execution to avoid disrupting traffic and damaging existing infrastructure.

Mitigation:

- Coordinate closely with the Kisumu County Government to obtain necessary permits and approvals for road crossings.
- Implement trenchless technology, such as horizontal directional drilling (HDD), to minimize surface disruptions and expedite road crossings.
- Work during off-peak traffic hours to reduce the impact on road users and ensure proper road reinstatement after crossing works.

7.8. Potential impacts and mitigation measures during construction phase

7.8.1. Disruption of businesses within the project area

Impacts on loss of revenue associated with the proposed project have been looked at from the point of view of individual business that will be affected by project. Most of the businesses in question include kiosks owners and hawkers. Most of these are located along project alignment areas and will be affected temporarily during construction process. The disruptions of the socio-economic activities have the potential of leading to losses of revenue.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	4	9	9	81
	Whole site	One month to one year	Harmful	Daily	Likely			Medium-high
Mitigation Measures	• There are business owners who are operating businesses within road reserves in Arina, Wathorego market, and Kisumu CBD who will be compensated for the loss of revenue. They will be allowed to to continue with their businesses after the pipes have been laid and trenches backfilled. The impacts will therefore be short term. Some of the business noted along the wayleave that will be impacted are provided in appendix C& E. • In situations where the businesses are outside the road reserve but must be affected by the works since the access will be excavated, KIWASCO will ensure the works will be done during Sundays or at nights when the businesses are closed. • Loss of revenue from disrupted services e.g. water shall be mitigated through expeditious restoration							
With mitigation Measures	1	1	1	4	1	3	6	15
	Activity specific	One day to one month	Non harmful	Weekly	Almost impossible			Very Low

7.8.2. Disruption of services within the project alignment area

The water networks being overhauled are critical transmission lines serving large sections of Kisumu, including the CBD. During the implementation phase, service downtime is inevitable. As the lines are interconnected, a disruption in one part of the network could affect other areas, leading to widespread service outages. Prolonged service downtime will not only inconvenience consumers but also result in significant revenue losses for KIWASCO. This could further strain customer relations and lead to complaints or legal claims for compensation.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	3	9	8	72
	Whole site	One month to one year	Harmful	Daily	Infrequent			Medium - Low
Mitigation Measures	• Schedule construction activities during off-peak hours and notify consumers in advance about expected service interruptions. • Implement temporary water supply solutions, such as water tankers or auxiliary lines, to serve critical consumers during downtime. • Install sectional valves to isolate parts of the network during maintenance, reducing the number of affected consumers.							
With mitigation Measures	1	1	1	4	1	3	5	15
	Activity specific	One day to one month	Non harmful	Weekly	Almost impossible			Very Low

7.8.3. Impact on access to premises

These impacts shall emanate from excavation works. The residents will be inconvenienced during this phase.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	2	9	7	63
	Whole site	One month to one year	Harmful	Daily	Very seldom			Medium-Low
Mitigation Measures	• The sections will be restored by the contractor • Alternative access will be provided by the contractor. • same-day excavation and backfilling of trenches to minimize the disruption; provision of access ramps across open trenches							
With mitigation Measures	1	1	1	4	2	3	6	18
	Activity specific	One day to one month	Non harmful	Weekly	Very seldom			Very Low



Figure 7-2: Access road in Guba



Figure 7-3: pipeline route in Gudka Estate

7.8.4. Impact on public infrastructure

There are instances where the proposed project infrastructure will cross public roads thus disrupting traffic flow. Roads within the project area are likely to be temporarily blocked by excavated materials. Road surfaces may also be interfered with because of trenching works.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	2	9	7	63
	Whole site	One month to one year	Harmful	Daily	Very seldom			Medium-Low
Mitigation Measures	(i) Micro-tunnelling will be undertaken on major roads (ii) All excavated soil shall be used for backfilling of trenched areas and site restoration. (iii) Damaged road surfaces shall be adequately restored to pre-excavation conditions. (iv) Excess spoil materials shall be disposed of in approved tips in compliance with existing laws, rules and regulations							
With mitigation Measures	1	2	1	4	2	3	6	18
	Activity specific	One day to one month	Non harmful	Weekly	Very seldom			Very Low

7.8.5. Blockage of drainage channels

Drainage blockages due to temporary disruption of surface runoff as a result of the construction process will be experienced. Inadequate drainage could lead to waterlogging and erosion. Collaboration with the county government is necessary to implement proper drainage systems, which could delay the project if not addressed in a timely manner.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	2	9	7	72
	Whole site	One month to one year	Harmful	Daily	Very seldom			Medium-Low
Mitigation Measures	(i) Working during dry weather conditions, if possible. Unclogging all blocked storm water drainage channels shall be implemented during rainy seasons. (ii) Collaborate with the Kisumu County Government to upgrade drainage infrastructure along the Kamaler-Guba route. (iii) Engage the community in clearing encroached areas and rehabilitating storm drains to improve water flow. (iv) Design the pipeline installation to avoid low-lying areas susceptible to flooding, incorporating proper drainage channels as part of the project.							
With mitigation Measures	1	1	1	4	2	3	6	18
	Activity specific	One day to one month	Non harmful	Weekly	Very seldom			Very Low



Figure 7-4: *Existing drainage at Guba area*



Figure 7-5: *Existing drainage at Gudka Estate*

7.8.6. Accidents and Injuries to workers and residents

Activities associated with construction such as excavating of trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site increase the risk of injury. Construction activities will also result in access of the area by vehicles delivering materials to the site that may result in accidents/incidents. Work at the proposed site may involve hazards such as accidental falls into open trenches, slippery walkways, working at heights, exposure to energized circuits, and heavy equipment.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	4	9	9	81
	Whole site	One month to one year	Harmful	Daily	Likely			Medium-High
Mitigation Measures	• The Contractor shall conform to all the stipulations of the Occupational Health and Safety Act, 2007. The Act requires the designation of a Health and Safety representative when more than 20 employees are deployed. • The contractor shall provide ample warning signs, guard rails, warning tape, etc., around open excavations, stacks of material, debris, etc. and shall be held liable for all claims as a result of neglect of such precautions and provisions. • Proper access control should be enforced to ensure that no unauthorised persons enter the site. • Material delivery vehicles should be under the control of competent personnel. Ensure that persons handling equipment and materials are suitably trained, supervised and adequately instructed. • Use of requisite Personal Protective Equipment (PPE) always during construction works • Maintain work areas to minimize slipping and tripping hazards. • Use proper techniques for trenching for example slopping and benching to prevent collapse. • When installing or repairing mains adjacent to roadways, implement procedures and traffic controls, such as establishment of work zones so as to separate workers from traffic and from equipment as much as possible; reduction of allowed vehicle speeds in work zones to 10km/hr; and use of high-visibility safety apparel for workers in the vicinity of traffic							

With mitigation Measures	1	2	1	5	1	4	6	24
	Activity specific	One month to one year	Non harmful	Daily	Almost impossible			Very Low

7.8.7. Health and safety risks to residents

The public as well as workers are at risk from projects such as this project, particularly from construction traffic. The project will generate substantial amount of traffic compared to the non-project situation. This traffic will be travelling on the public roads within the project area. Accidents could occur due to excessive speeds, unsafe loading, poor road surfaces, poor vehicle maintenance, and unwary pedestrians, especially drunken men, and children.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	2	4	5	4	9	9	81
	Whole site	One month to one year	Harmful	Daily	Likely			Medium-high
Mitigation Measures	• Establish and enforce a strict code of conduct for all project drivers including outside suppliers delivering materials. The code should focus on safety, especially speed, and loading, especially banning all carriage of staff, workers and passengers except in seats. • Same-day backfilling of trenches; covering/barricading of open chambers; sequential construction (excavation and immediate backfilling of trenches; excavation of chambers, immediate construction and covering of the chambers)							
With mitigation Measures	1	2	1	5	1	4	6	24
	Activity specific	One month to one year	Non harmful	Daily	Almost impossible			Very Low

7.8.8. Solid waste generation

Construction will result in the generation of various solid wastes, principally surplus aggregates, metal scraps, plastics (wrappings and containers) and wood. During operation phase, the project will generate a variety of waste types which must be disposed of in accordance with national laws and regulations.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	2	2	5	3	6	8	48
	Regional	One month to one year	Potentially harmful	Six monthly	Likely			Medium to low
Mitigation Measures	• Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable to the environmental consultant. • Construction site management plans will be required for all works. This plan will include a waste management plan for all activities during the construction period.							

	• Bins/ receptacles shall be placed at appropriate locations within the site as collection centres to facilitate separation and sorting of the various types of wastes. • The contractor shall work hand in hand with private waste handlers and local council to facilitate sound waste management; and • The wastes shall be properly segregated and separated to encourage recycling of some useful waste materials.							
With mitigation Measures	1 Activity specific	1 One month to one year	1 Non harmful	5 Daily	1 Almost impossible	3	6	18 Very Low

7.8.9. Soil erosion

Soil erosion may occur due to uncontrolled excavation of trenches during rainy seasons, from inadequacies in backfilling construction works and improper drainage of storm water. Excavation works will expose soil to agents of erosion leading to soil erosion problems. Occurrence of the impact will be short term and will be restricted to construction phase of the project. Implementation of mitigation measures can reduce the impact to significance of low to negligible.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3 Whole site	3 One year to ten years	2 Potentially harmful	5 Six monthly	4 Likely	8	9	72 Medium-Low
Mitigation Measures	• Avoid hampering drainage of surface water and plan for restoration measures after construction. • At the end of construction works, level off the soils and facilitate vegetation regeneration.							
With mitigation Measures	1 Activity specific	1 One day to one month	1 Non harmful	5 Daily	1 Almost impossible	3	6	18 Very Low

7.8.10. Air Pollution

The expected air pollutants from the proposed project will include dust, particulate matter and gaseous emissions from construction materials. Dust will be generated from the excavations, batching activities, earth moving and materials delivery. Particulate matter will be generated by dry construction materials including sand, cement, gravel, murram, etc. Smoke, hydrocarbons and nitrogenous gases will be emitted from machinery exhausts. These will be expected to increase slightly and will be localized hence expected to be experienced within 30m radius of the project. Air pollution is expected to be a low-key impact during the construction period.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance

Without Mitigation	4	2	3	5	3	9	8	72
	Regional	One month to one year	Harmful	Daily	Infrequent			Medium- Low
Mitigation Measures	• Impose speed limits (10 km/h in all areas within the site boundaries). • Damping down of access roads, stockpiles and cleared areas must take place to minimize dust pollution. • Ensure that no refuse wastes are burnt on the premises or surroundings. Refuse wastes should be removed by an official contractor and dumped at an approved site in compliance with local laws and regulations. More significantly, an Integrated Solid Waste Management system is encouraged. • Proper rehabilitation and restoration of disturbed areas is required in order to minimize bare patches. • Vehicles to be used during the construction phase are to be kept in good working condition and should not be the source of excessive fumes. • Transported materials must be done in such a manner that they do not fly or fall off the vehicle by covering or wetting friable materials. • Sprinkle water before undertaking very dusty operations to reduce dust pollution. • Dust and air pollution due to dust when excavated material is stock piled, should be limited by means of wetting (particularly dry season), covering with foil or working in small sections so that the trenches are backfilled with excavated soil within shortest possible period (maximum 2 days).							
With mitigation Measures	1	1	1	3	1	3	4	12
	Activity Specific	One day to one month	Non harmful	Monthly	Almost impossible			Very Low

7.8.11. Noise Impact

Construction activities associated with the proposed project are likely to increase noise level to more than what is experienced under non project scenario. Use of heavy construction machinery including excavators, water pumps and generators will lead to relative noise levels. Fabrication of site equipment and concrete mixing both at the contractor's workshop and at the construction site will generate significant noise levels. Material delivery is also expected to lead to significant noise levels during construction phase. Operation phase of the project is however not associated with significant noise pollution.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	1	2	2	2	4	5	6	24
	Activity specific	One month to one year	Potentially harmful	Six monthly	Likely			Very low
Mitigation Measures	• Schedule road traffic movements to normal working hours (08H00 –17H00). • Silencers on equipment such as generators will be properly designed. • Where need be, all exposed workers will be provided with functional ear muffs, whose use is mandatory, and closely enforced, monitored and supervised.							
	1	2	1	2	1			12

With mitigation Measures	Activity specific	One month to one year	Non harmful	Six monthly	Almost impossible	4	3	Very Low

7.8.12. Water supply disruption

Disruption of water supply due to shutting off valves during construction works may lead to service disruption in some service areas during construction period. Flushing of the system may also lead to temporary water supply disruption during operation phase although this will be of negligible impact significance.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	4	2	2	5	4	8	9	72
	Regional	One month to one year	Potentially harmful	Daily	Likely			Medium-Low
Mitigation Measures	• Give warning to consumers so that they can store water that can last them within the period of disruption • Ensure that water services are restored within 24 hours and keep records of restoration as evidence.							
With mitigation Measures	2	1	1	4	1	4	5	20
	Area specific	One day to one month	Non harmful	Weekly	Almost impossible			Very Low

7.8.13. Sexual exploitation and abuse of community members by project workers

This impact refers to sexual exploitation and abuse committed by Project staff against communities, and represents a risk at all stages of the Project, especially when employees and community members are not clear about prohibitions against SEA in the Project. The project will experience the influx of people who will be seeking employment during construction phase, therefore, SEA will be a critical aspect to be monitored.

Mitigation:

- Develop and implement and SEA action plan with an accountability and Response Framework as part of the C-ESMP. The SEA action plan will follow guidance on the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018).
- The SEA action plan will include how the project will ensure necessary steps are in place for:
  - ✓ *Prevention of SEA*: including Code of Conducts (CoC) and ongoing sensitization of staff on responsibilities related to the COC and consequences of non-compliance;
  - ✓ *Response to SEA*: including survivor-centered multi-sectoral referral and assistance to complainants; staff reporting mechanisms; written procedures related to case oversight, investigation and disciplinary procedures at the project level

- ✓ *Engagement with the community*: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of PSEA awareness-raising in all community engagement activities; IEC materials; regular community outreach to women and girls about social risks and their PSEA-related rights;
- ✓ *Management and Coordination*: including integration of SEA in job descriptions, employments contracts, performance appraisal systems, etc.; development of contract policies related to SEA, including whistleblower protection; training for all project management; management of coordination mechanism for case oversight, investigations and disciplinary procedures; supervision of dedicated Prevention of Sexual Exploitation and Abuse (PSEA) focal points and trained community liaison officers.

7.8.14. Gender-based violence at the community level:

GBV constitutes acts of gross misconduct and are therefore grounds for sanctions, penalties and/or termination of employment. This impact refers to gender-based violence at the community level that women and girls may experience as a result of Project implementation. This includes, for example, an increase in intimate partner violence (IPV) when compensation schemes that share funds equally among husband and wife at the household level do not provide adequate sensitization and safety measures to reduce potential for increased tensions due to females receiving funds. This also refers to other GBV-related risks incurred as a result of project implementation that do not adequately consult women and adolescent girls in the community about safety and security issues related to the delivery of water services.

Mitigation:

- Develop and implement provisions that ensure that gender-based violence at the community level is not triggered by the Project, including:
  - ✓ effective and on-going community engagement and consultation, particularly with women and girls;
  - ✓ review of specific project components that are known to heighten GBV risk at the community level, e.g. employment schemes for women; delivery of supplies; etc.
  - ✓ Specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to employment; supply services; etc
- Ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation.

7.8.15. Violation of children rights by contractor and labour force on site:

Violence against Children (VAW) is defined as physical, sexual, emotional and/or psychological harm, neglect or negligent treatment of minor children (i.e. under the age of 18), including exposure to such harm, that results in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power. This includes using children for profit, labor, sexual gratification, or some other personal or financial advantage. This also includes other activities such as using computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography.

The Children Act of Kenya prohibits contractors from "employing children in a manner that is economically exploitative, hazardous, and detrimental to the child's education, harmful to the child's health or physical, mental, spiritual, moral, or social development. The possibility of

contractor children abuse is through hiring of child labour, also labour force on site might abuse children within the Project area through sexual advance that could lead to early pregnancies and school dropout including exposure to communicable diseases such as HIV and AIDS. It is also important to be vigilant towards potential sexual exploitation of children, especially young girls. The contractor should adopt a 'Child Protection Code of Conduct'; that all staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behaviour. That notwithstanding, the contractor should take responsibility if any of the suppliers and subcontractors contravene this law.

The contractor will undertake the below listed mitigation measures.

Mitigation:

- Develop and implement a Children Protection Strategy that will ensures minors are protected against negative impacts associated by the Project.
- All staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behavior
- Children under the age of 18 years shall not be hired on site as provided by Child Rights Act (Amendment Bill) 2014.

7.8.16. Spread of HIV/AIDS, STIs and other communicable diseases

The project will bring together groups of people, such as workers, community members, or visitors, which can lead to increased social interactions and mobility, contributing to the spread of HIV/AIDS and STIs. Economic development may also encourage behaviors associated with higher risk, such as multiple sexual partnerships. Migrant workers could introduce new infections or increase the transmission rates of existing diseases, while women and young girls may be more vulnerable due to gender inequalities and transactional relationships.

Mitigation Measures:

- Carry out periodic HIV/AIDS awareness training for workers and the beneficiary community.
- Distribution of condoms to workers and beneficiary communities, especially the CIGs.
- Carryout voluntary HIV/AIDS testing for workers and community members.
- If tested positive, further guidance will be offered and directed to the nearest public hospital to receive free antiretroviral (ARVs) drugs and other services.
- The project team should use the services of contracted GBV/SEAH service providers to undertake community outreach activities.
- Hire local workers where possible to minimize the extent of any influx.
- All workers shall sign CoC/ contract that has provisions on GBV/SEAH.

Impact Criteria	Spread of HIV/AIDS, STIs, and Other Communicable Diseases
Impact Nature	Health-related, social, and cultural impacts
Impact Type	Negative impact
Impact Severity	High – the spread of communicable diseases can lead to significant morbidity and mortality
Impact Duration	Long-term – may persist for years or even decades if not addressed

Impact Extent	Local to regional – affects the immediate project area and potentially surrounding areas
Likelihood of Occurrence	High – given the increased social interactions, migration, and possible gaps in health systems
Potential for Irreplaceable Loss of Resource	Moderate to high – the loss of health and well-being can have long-lasting effects on the community's development
Impact Magnitude	Large – can significantly affect the overall health of the community and hinder project success
Impact Significance	Very high – can affect community stability, project outcomes, and public health in the region

7.8.17. Workers/Labour Influx Impacts

The project will attract an influx of workers and laborers to the area, which could lead to increased pressure on local resources such as housing, water, and food supply, potentially resulting in higher costs for community members. This influx may also strain local infrastructure, including transportation and healthcare services, as the population temporarily grows. Additionally, there may be social tensions between local residents and the incoming workforce, especially if there is perceived inequity in job opportunities or access to benefits. The potential for increased incidences of crime and conflicts may arise, as well as concerns about the impacts of a transient labor force on the local culture and social dynamics.

Impact Criteria	Workers/ Labour Influx Impacts
Impact Nature	Social and economic strain
Impact Type	Negative
Impact Severity	Moderate to High
Impact Duration	Temporary to Medium-term
Impact Extent	Localized to project area, but could spill over into surrounding communities
Likelihood of Occurrence	Likely
Potential for Irreplaceable Loss of Resource	Low to Moderate (depends on resource strain)
Impact Magnitude	Moderate to High
Impact Significance	High due to potential for social unrest and resource scarcity

Mitigation measures:

- Ensure that locally available labour force is given priority during recruitment. Especially for casual and unskilled positions.
- Providing accommodation for workers in camps if the workforce is large

7.9. Potential impacts and mitigation measures during operation phase

7.9.1. Water system leaks and loss of pressure

Water system leaks can reduce the pressure of the water system compromising its integrity and ability to protect water quality (by allowing contaminated water to leak into the system) and increasing the demands on the source water supply and the quantity of chemicals. Leaks in the distribution system can result from improper installation or maintenance, inadequate corrosion protection, stress from traffic and vibrations and overloading among other factors.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	4	2	4	5	3	10	8	80
	Regional	One month to one year	Harmful	Daily	Infrequent			Medium-High
Mitigation Measures	• Ensure construction meets applicable standards and industry practices. • Conduct regular inspection and maintenance. • Implement a leak detection and repair program (including records of past leaks and unaccounted- for water to identify potential problem areas);							
With mitigation Measures	2	1	1	5	1	4	6	24
	Area specific	One day to one month	Non harmful	Daily	Almost impossible			Very Low

7.9.2. Water Discharges

Water lines may be periodically flushed to remove accumulated sediments or other impurities that have accumulated in the pipe. Flushing is performed by isolating sections of the distribution system and opening flushing valves or, more commonly, fire hydrants to cause a large volume of flow to pass through the isolated pipeline and suspend the settled sediment. The major environmental aspect of water pipe flushing is the discharge of flushed water, which may be high in suspended solids and other contaminants that can harm surface water bodies.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	3	1	2	2	2	6	4	24
	Regional	One day to one month	Potentially harmful	Six monthly	Highly unlikely			Very low
Mitigation Measures	• Where possible, flushed water should be carried in bowsers for discharge • Discharge the flush water into a separate storm system with storm water management measures such as a detention pond, where solids can settle and residual chlorine consumed before the water is discharged; • Where water is flushed into the environment, erosion should be minimised during flushing by avoiding discharge into areas that are susceptible to erosion and spreading the flow to reduce flow velocities.							
With mitigation Measures	2	1	1	2	1	4	3	12
	Area specific	One day to one month	Non harmful	Six monthly	Almost impossible			Very Low

7.9.3. Deficiencies in water distribution system

The water distribution system is a critical component in delivery of safe potable water. Even if water is effectively treated to remove contaminants and destroy pathogens, waterborne diseases outbreaks can occur because of deficiencies in the water distribution system. Exposure of water to pathogens from storage facilities and from external sources may lead to long term impacts whose effects will be experienced regionally. The severity of the impacts will be high without mitigation measures.

Significance of impact

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	4	2	4	5	4	10	9	90
	Regional	One month to one year	Harmful	Daily	Likely			Medium - High
Mitigation Measures	(i) Construct, operate, and manage the water distribution system in accordance with applicable national requirements and internationally accepted standards. (ii) Construct and maintain the distribution system so that it acts as a barrier and prevents external contamination from entering the water system by: • Inspecting storage facilities regularly and rehabilitating or replacing storage facilities when needed. This may include draining and removing sediments, applying rust proofing, and repairing structures • Ensuring that all installation, repair, replacement, and rehabilitation work conforms to requirements for sanitary protection and materials quality • Testing material, soil, and water quality and implementing best practices to prevent corrosion, such as cathodic protection (iii) Maintain adequate water pressure and flow throughout the system by: • Implementing a leak detection and repair program • Reducing residence time in pipes • Maintaining positive residual pressure of at least 20 pounds per square inch (psi) • Monitoring hydraulic parameters, such as inflows, outflows, and water levels in all storage tanks, discharge flows and pressures for pumps, flows and/or pressure for regulating valves, and pressure at critical points, and using system modelling to assess the hydraulic integrity of the system (iv) Prevent introduction of contamination from the distribution system itself by: • Minimizing microbial growth and biofilm development (e.g. by ensuring adequate residual disinfection levels). Collect samples from several locations throughout the distribution system, including the farthest point, and test for both free and combined chlorine residual to ensure that adequate chlorine residual is maintained • Using construction materials that do not contribute to release undesirable metals and other substance or interact with residual disinfectants							
With mitigation Measures	2	1	1	5	1	4	6	24
	Area specific	One day to one month	Non harmful	Daily	Almost impossible			Very Low

7.10. Climate change and vulnerability assessment

Climate Change Act of 2016 is an Act of parliament to provide for a regulatory framework for enhanced response to climate change, to provide for mechanism and measures to achieve

low carbon climate development and for connected purposes. The purpose of climate risk vulnerability assessment (CRVA) is to understand the climate and assess climate change threats to the proposed development to assess adaptation measures that are proposed in the design; to determine to what extent the performance and design of the project is vulnerable to climate change, and to recommend measures that will improve the climate resilience of the proposed project.

Climate change have been observed in Kenya. These include general warming, reduced amount of intense rainfall during the rainy season, and more intense and frequent rainfall during the rest of the year (Government of Kenya, 2010). Other literature also reports changes in the climate of Kenya, such as severe or prolonged drought (UNICEF, 2010), desertification (Plan Kenya, 2013), and changing rainfall patterns (de Wit & Stankiewicz, 2006; UNICEF, 2010). A report by Chaocheva (2016) observed a slight and insignificant increase in precipitation in Nakuru county and a more significant increase in minimum temperature, while National Climate Change Response Strategy (NCCRS, 2010) state that climate change in Kenya is *"already unmistakable and intensifying at an alarming rate with evident countrywide temperature increases and rainfall irregularities and intensification"*.

Climate change affects the four components of food security - food availability, food accessibility, food utilization and food system stability - in various direct and indirect ways. As a result of climate change, there will be increased frequency and intensity of extreme weather events like droughts and floods, which will lead to losses of productive assets, personal possessions and even life. This has already been observed but will intensify in the future if efforts are not raised to stop global warming. For instance, due to droughts, the country's famine cycles have reduced from 20 years (1964-1984) to 12 years (1984-1996), to two years (2004-2006) and to yearly (2007/2008/2009), necessitating the Government's distribution of 528,341.77 metric tonnes of assorted foodstuffs. Extreme climatic variations coupled with improper land use including deforestation have resulted into Kenya reporting successive seasons of crop failure, increasing the country's food insecurity.

Climate change can impact the availability and quality of both surface and groundwater and affect agricultural production and associated ecosystems. Increasing variability of rainfall can influence the flow of water in surface systems and the rates of recharge and discharge from aquifers. Currently, main water sources in the county are groundwater. The potential effects of climate change on groundwater will be much on shallow aquifers.

Risk Impacts Identified:

- Reduced water availability due to decreased rainfall or prolonged droughts.
- Degradation of water quality from higher temperatures and altered flow patterns.
- Infrastructure stress and potential damage from extreme weather events.

Adaptation Strategies:

- Upgrade and design water infrastructure to be more resilient to extreme weather.
- Implement water conservation measures and diversify water sources (e.g., rainwater harvesting, recycled water).
- Establish robust monitoring systems and early warning mechanisms for rapid response.

- Enhance community engagement and capacity building to ensure local preparedness.

7.11. Cumulative impacts

The Environmental and Social Assessment have taken into consideration assessment of potential cumulative impacts of this project and other project planned and ongoing along/adjacent to the project area. The cumulative impacts are summarized in Table below.

Environmental Topic	Potential Cumulative Impacts	Mitigation Measures
Water Supply and Wastewater Generation	The project will increase water supply capacity, which may lead to a proportional increase in wastewater generation. This could strain existing wastewater treatment facilities and affect water quality in nearby water bodies if not managed properly, necessitating upgraded treatment facilities to prevent pollution.	Plan for future upgrades to wastewater treatment facilities and other infrastructure to accommodate increased demand and mitigate potential negative impacts.
Infrastructure Strain	Upgrades and repairs to existing pipelines might cause temporary disruptions. However, the improved infrastructure will ultimately lead to better service delivery. Long-term impacts will include enhanced reliability of water supply and reduced maintenance needs, which could ease the burden on existing infrastructure.	Implement construction in phases to limit the scope of disruption at any given time. This approach allows for continuous operation of existing infrastructure and reduces the overall impact on service delivery.
Dust	Dust from excavation and construction activities can affect air quality and public health. The cumulative effect of dust from this project and other concurrent developments may exacerbate respiratory issues and degrade environmental quality in the project area.	Regular monitoring of noise, dust, water quality, and other environmental parameters to assess the cumulative effects and address any emerging issues.
Noise	Construction activities for the pipeline project will generate noise, which, when combined with noise from other nearby projects, could lead to significant cumulative noise pollution. This impact may affect residential areas, schools, and other noise-sensitive receptors.	

8. ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING PLAN

8.1. Introduction

The purpose of developing an Environmental and Social Management Plan (ESMP) for the proposed project is to initiate a mechanism for implementing mitigation measures for the potential negative environmental impacts and monitor the efficiency of these mitigation measures based on relevant environmental indicators. The ESMP identifies certain roles and responsibilities for different stakeholders for implementation, supervision and monitoring.

The objectives of the ESMP are:

- To provide evidence of practical and achievable plans for the management of the proposed project.
- To provide the Proponent and the relevant Lead Agencies with a framework to confirm compliance with relevant laws and regulations.
- To provide community with evidence of the management of the project in an environmentally acceptable manner.

Conversely, Environmental monitoring provides feedback about the actual environmental impacts of a project. Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. A monitoring plan, backed up by powers to ensure corrective action when the monitoring results show it necessary, is a proven way to ensure effective implementation of mitigation measures. By tracking a project's actual impacts, monitoring reduces the environmental risks associated with that project, and allows for project modifications to be made where required.

8.2. Management Responsibilities

In order to implement the management plan, it is recommended that a supervisor is identified to oversee environment and management aspects including the water abstraction sustainability, pollution control, water loss control and equity access, throughout the project area. The supervisor would also be expected to co-ordinate and monitor environmental management during construction and provide monitoring schedules during operations. Other recommended participants could include the respective Environmental Officers, Water Offices and the Physical Planning Offices among others.

8.3. Environmental Management Guidelines

Upon completion and commissioning of the water project, it will be necessary to establish appropriate operational guidelines on environmental conservation and social linkages to enable the operations' management to identify critical environmental and social issues and institute appropriate actions towards minimizing associated conflicts. Basically, the guidelines should cover among other areas environmental management progammes, standard operation procedures, compliance monitoring schedule and environmental audit schedules as required by law. Social harmony of the facilities and associated component will be achieved through collaborations with the stakeholders or community management committees at various water points. It is recommended that the communities' in-charge of the water intervention facilities must have an accountable structure. While appreciating that there is an existing social framework, it should be recognized that they lack in organizational capacity to manage water

facilities at a commercial level. The groups will therefore, need to get re-organized to provide for clear responsibilities, documentation and record keeping as well as resource accounting.

8.4. Environmental Education and Awareness Raising

KIWASCO field staff and the beneficiaries will need to understand the basic environmental, water use principles associated with the projects. In this regard, therefore, the following steps will need to be considered.

(i) Creation of liaisons on all matters related to environment, utilization of water, health, safety, sanitation and hygiene issues of the water resource development,

(ii) Encourage contribution of improvement ideas from the beneficiaries on specific issues related to the management of the facilities, water accessibility, water availability, sharing, etc. say through a questionnaires or direct interactions,

(iii) Establish initiatives that would instill a sense of ownership of the facilities and related components to all beneficiaries,

8.5. Decommissioning Process

Due to the long-term life of the intervention facilities and related components, a decommissioning audit will be undertaken before the process for any of the components commences, following a notice to decommission. The decommissioning process will be guided by a comprehensive decommissioning plan developed through the decommissioning audit process. However, the following features will need to be decommissioned upon completion of the works.

(i) Contractor's camp and installations that will need to be removed without compromising on the safety and general welfare of the immediate residents. Special care to be given to associated wastes and dust emitted in the process,

(ii) Materials stores that will comprise fresh materials and used items. Each category will be moved safely out of site ensuring minimal or no impacts to the related environment and social setting,

(iii) Wastes and debris holding sites will be cleared with maximum re-use of the debris either on surfacing the passageways or other grounds such as schools and church compounds.

8.6. Environmental & Social Management Plan (ESMP)

This ESMP is prepared for the three project stages where potential significant negative impacts manifest.

These are:

i. Construction Phase ESMP.

ii. Operation Phase ESMP; and

iii. Decommissioning Phase ESMP.

Table 24:ESMP

Impacts	Mitigation measures	Responsibility	Parameters to Monitor	Monitoring Means	Frequency of Monitoring	Estimated Cost (Kshs)
Damage on the roads	Coordinate with KeRRA, KURA and Kisumu county government during construction activities to avoid adverse impacts on the roads. Excavation works should be done during off-peak hours.	Contractor, Kisumu County Govt., KURA, KeRRA	Number of scheduled road crossings, traffic flow management	Traffic permits, work schedule records	During road crossings	70,000
	Implement trenchless technology to minimize disruption especially on road crossings (Micro-tunneling)	Contractor	Number of trenchless crossings completed	Trenchless technology reports	During road crossings	1,000,000
Disruption of business	Notify businesses of upcoming disruptions; restore affected areas promptly.	KIWASCO	Number of notifications issued, promptness of restoration	Notification logs, site inspection reports	Ongoing during construction	50,000
	Provide compensation for loss of revenue for Project Affected Persons (PAPs).	KIWASCO	Compensation records, feedback from PAPs	Compensation reports, grievance records	As per the PAP register in appendix E	150,000 (cost as per the PAP register)
Water Supply Disruption	Schedule construction activities to minimize service interruptions; notify residents in advance; provide temporary water sources if needed.	Project Manager	Water supply continuity; Notification effectiveness	Service reports; Public feedback	Weekly	100,000

Impacts	Mitigation measures	Responsibility	Parameters to Monitor	Monitoring Means	Frequency of Monitoring	Estimated Cost (Kshs)
Solid Waste Generation	Develop and implement a waste management plan during construction.	Contractor	Waste management plan completion, compliance with plan	Waste management records, site inspections	Weekly	50,000
	Ensure proper segregation and disposal of all waste in collaboration with licensed waste handlers.	Contractor	Waste segregation, disposal records	Waste disposal logs, waste handler contracts	Ongoing during construction	60,000
Soil Erosion	Implement proper drainage and backfilling techniques post-excavation.	Contractor,	Completion of backfilling, proper drainage installation	Inspection reports, site visits	During construction and post-construction	20,000
	Ensure vegetation regeneration after construction is completed.	Contractor	Area of restored vegetation, completion of landscaping	Post-construction inspection reports	Post-construction, monthly	30,000
Accidents and Injuries to Workers and Residents	Ensure compliance with the Occupational Health and Safety Act (2007).	Contractor	Number of safety incidents, availability of Personal Protective Equipment (PPE)	Safety audit reports, incident logs	Daily during construction	50,000
	Install warning signs, barriers, and traffic controls in high-risk areas.	Contractor	Number of safety installations in place, site conditions	Site inspection, safety report	Daily during construction	50,000
Accessibility and	Hold public participation meetings to resolve access issues.	Contractor, Community Liaison Officer	Number of meetings held, community feedback	Meeting minutes, grievance logs	Monthly	50,000

Impacts	Mitigation measures	Responsibility	Parameters to Monitor	Monitoring Means	Frequency of Monitoring	Estimated Cost (Kshs)
Potential Conflicts	Provide alternative access routes during construction.	Contractor	Established alternative routes	Traffic management plan, site inspection reports	Ongoing during construction	100,000
Influx of workers	• Hiring unskilled construction and skilled (if available) labour from the local population as far as possible. • Prepare influx of workers plan.	Proponent Contractor	No. of local people employed	influx of workers plan.	Ongoing during construction	20,000
Spread of HIV/AIDS and other STI	Sensitizing workers and the surrounding community on awareness, prevention and management of HIV / AIDS.	Proponent Contractor	HIV/AIDS awareness	Periodic reports	Ongoing during construction	50,000
Sexual exploitation and abuse of community members by project workers	Develop and implement SEA action plan with an Accountability and Response Framework as part of the C-ESMP. Engagement with the community	Proponent contractor	No. of Complaints	Minutes of meetings	Ongoing during construction	20,000
Gender-based violence	The contractor will implement provisions that ensure that gender-based violence at the community level is not triggered by the Project.	Proponent Contractor	No. of Complaint	Number of the sensitization Meetings	Ongoing during construction	20,000

Impacts	Mitigation measures	Responsibility	Parameters to Monitor	Monitoring Means	Frequency of Monitoring	Estimated Cost (Kshs)
	Operation phase					
Illegal connections	Install tamper-proof valves and smart metering systems.	KIWASCO, Contractor	Number of smart meters installed, tamper-proof valves in place	Site inspection, installation records	During operation	Annual O&M budget
	Increase surveillance and patrols to prevent illegal connections.	Security Teams	Patrol schedules, number of illegal taps identified	Patrol logs, incident reports	Weekly	Annual O&M budget
Water System Leaks and Loss of Pressure	Conduct regular inspections and maintenance; ensure proper installation; monitor pressure levels and leak reports.	Maintenance Team	Leak occurrences; Pressure levels	Inspection reports; Pressure gauges	Daily	Annual O&M budget
Water Discharges	Implement measures to control discharge quality; use settling tanks or filtration; ensure proper disposal of flushed water.	Environmental Officer	Water quality; Discharge volumes	Water quality tests; Discharge records	After each flushing event	Annual O&M budget

8.7. Environmental & Social Monitoring

The management of environment and social impacts and consequences of every proposed project is a regular, all purpose and continuous activity, which commences from the beginning of the project and the initial plan of its establishment, and until termination of the project life and thereafter. The performance of this management rests on an appropriate administrative structure, known as the environmental & social management unit, which is a section of the management and operation aggregate of the plan. Outlooks and the principals of environmental conservations must proceed in all the various angles of management.

The objectives of this plan are to render suitable methods and perform effective measures of acceptable costs, to reduce the destructive impacts arising from the establishment and operation of the proposed project in regards the regional environment and its accordance with the standard and desirable conditions, in rendering monitoring and control plans, public participation and environmental training. Hence, in this chapter, in addition to rendering the plan for each monitoring index, by specifying the responsible or relative organizations and estimating the organizational and implementation requirements, conditions for the execution of environmental plan are alleviated.

8.7.1. Internal Monitoring

Though most of the mitigation measures will be implemented by the Construction contractor as per contract condition, the overall responsibility related supervision and monitoring of ESMP implementation and compliance of HSE requirement lies with project proponent. The evaluation of compliance of ESMP implementation and HSE management will be guided by Construction ESMP (CESMP) to be prepared by the contractor based on site specific conditions before start of construction and approved by Project proponent. The CESMP shall comprise of relevant sub-plans such as Erosion control and site restoration, biodiversity protection, Air Quality, Noise & Vibration, Waste Management, Traffic Management apart from Health & Safety Plan and emergency preparedness plan in line with mitigation measures suggested in ESIA.

The objective of internal monitoring and audit will be:

- To identify gaps in implementation of the ESMP by the contractor
- Ensure compliance to legal requirements provided in EMCA 1999
- Guide the contractor's management of HSE requirements from time to time where unforeseen impacts are encountered

The proponent will continue the monitoring process during the operation and decommissioning phases of the projects ensuring that the minimum allowable Environmental parameters are maintained. These parameters include,

1. **Workforce Training**

The contractor shall provide induction of workers to ensure they are adequately trained on HSE management on top of the specific skills required for their job description. The proponent should monitor induction training and toolbox talks records regularly. The contractor shall also train site specific HSE supervisors to enforce the trainings.

2. **Monitoring of Accidents Prevention/ Health Management**

The Proponent will procure services of an independent environmental, health and safety (HSE) consultant to undertake frequent audits on the contractor during project implementation. The consultant will undertake regular site inspection visits (frequency shall be agreed upon with Contractor) to monitor how the contractor is managing his work force and activities with regard to accident prevention and health management.

The contractor's safety manager on the other hand shall ensure that appropriate safety signage and personal protective equipment is availed to the construction workers at all times.

Indicators that will be used in evaluation of accident prevention and health risks management includes.

- Provision of adequate personal protective equipment to workers at all phases of the project
- Presence of displayed safety warning signs and markings at active sites and on tower structures on completion
- Adequate human waste disposal and sanitation facilities are present at active sites
- Community awareness on safety risks associated with the project
- Compiled records of actual accidents/ incidences that have been encountered
- Report health cases that are related to the project

3. **Soil Erosion and Conservation Monitoring**

Construction activities such excavations and transportation of construction materials within the project areas may lead to loosen soil structure thereby resulting in erosion. The contractor will be responsible for ensuring that appropriate soil conservation and erosion prevention measures are practiced throughout the construction phase.

4. **Noise Levels Monitoring**

Emission of noise is expected during the construction phase. Major sources of noise will be from machinery such as excavators. However, the noise levels may not be an issue as emission is site specific and low Regular monitoring of these noise levels by the Contractor should be conducted to ensure that they recommended limits are not exceeded. Consultation with the communities will aid in establishing the extent of this impact

5. **Air Quality Protection**

Dust and emissions from machinery should be monitored by the contractor and adequate measures employed in ensuring air quality. This will include watering down of active sites/ roads and other areas generating the dust or maintenance of machinery with excessive smoke emissions. In addition, where excessive wind is observed, dust generating activities can be halted for some time.

6. **Solid and Liquid Waste Management Monitoring**

Monitoring of waste generated at both the site and workers campsite during the construction phase shall be done by the contractor's HSE manager. He will ensure that;

- Records of the type and waste amounts generated at the sites is kept
- Adequate and separate waste management facilities are provided at each site. The equipment shall be such that it aids in waste segregation
- All generated waste is bound to the specific sites boundary and littering of the environment is discouraged
- Human waste disposal facilities are provided at each site
- Collected waste is properly disposed away from site at dumping sites approved by the local county government

7. Biodiversity monitoring
    - Monitor invasive species as they appear for timely control and physical removal

8.7.2. External Monitoring

The Kenyan government's environment management body NEMA shall issue approval for the implementation of the proposed project. Moreover, it shall ensure that the provided mitigation measures are implemented in implementation of the project. NEMA shall offer oversight of the implementing bodies through review of monitoring reports. The proponent shall therefore provide the agency with annual progress reports on environment, health and safety management

8.7.3. Environmental Audits (EA)

Environmental audits during all phases of the project implementation are key in ensuring full compliance to ESMP requirements. The goal of EA will be to establish if the proponent is complying with environmental requirements and enforcing the existing legislation. The purpose of EA is to determine the extent to which the activities and programs conform to the approved environmental management plan. The Consultant recommends that an independent consultant will be sourced to oversee environmental management throughout the construction phase and during the operational phase and decommissioning phase. He will provide Environmental audits in line with NEMA's requirement.

8.8. Grievance Management/Redress Mechanism

A Grievance Redress Mechanism GRM has been established to receive and facilitate resolution of complainants (project affected people, local community and workers) concerns and grievances regarding the project's performance during the construction, operation and decommissioning phases of the project. The mechanism should be able to address the concerns and complaints in a timely fashion by using an easy to understand, transparent and effective grievance redress process that is readily accessible to all segments of the project area population including workers and community members.

This GRM has been developed with the intention of providing an effective tool for early identification, evaluation and resolving of grievances during the full cycle of the project. The range of issues that are likely to arise requiring this process include:

- Unfair or biased job allocations.

- Poor management of construction activities.
- Compensation payment for services rendered or damages to property,
- Failure to fulfil commitments.
- Interference with public utilities.
- Accidents due to inappropriate planning of vehicle movement.
- Conflicts between migrant workers and local communities.
- Disturbance due to excessive noise or other nuisance during construction or operation.
- Unfair treatment of workers or unsafe working conditions.
- Issues related to Gender (GBV, SEA and VAC).
- Any other issues related to environment, health and safety issues

Since the range of issues is diverse, the GRM should be comprehensive enough to tackle complaints without any costs and also provide privacy to complainants especially gender issues.

An effective GRM should have the following:

- Identification of personnel (Grievance Officer who will be receiving and recording grievances at the site level);
- Process of evaluating grievances and determining which process to follow;
- Process of making decisions on providing resolutions.
- Notification procedures.
- Timeframes within which issues are to be resolved.
- Procedure for escalation of issues that cannot be resolved at the site level;

Publicizing of the GRM

The developed GRM should be publicized to ensure that all stakeholders (workers, community members, contractor, project management etc) are aware of the existence of the GRM and how it shall be used to resolve grievances.

Grievance Redress Committee (GRC) and Meeting Calendar

The GRC

The developer shall facilitate the formation of a two-tier Grievance Redress Committee (GRC) both at village level and project level. This committee shall comprise of the following representatives:

Level 1

- Affected persons
- Location Chief
- A Representative from the Community (Male and Female)
- Community liaison officer

Level 2

- Project manager/GRC officer
- Community liaison officer
- EHS Officer;
- Contractor EHS representative

GRC Meeting Calendar

The GRC shall roll out its meeting calendar to the stakeholders so that they are aware of when to expect their issues resolved. It should endeavour to meet as often as possible so that grievances do not remain unresolved for a long period. Other than the issues that the GRC Officer will be able to provide immediate solution when the complainants come lodge their complaints, the registered complaints will take between 21-45 days for resolution. It is therefore suggested that the GRC meets monthly or as dictated by any registered urgent grievance. In case complainant/ appellant is not satisfied with the decision of GRC they can approach court of law for resolution.

Special Representatives in the Committee

The proponent to consider having special representatives in the grievance committee (Female Members) who can deliberate and resolve grievances touching on gender issues like sexual harassment, rape etc). This will help in safeguarding privacy of victims of rape and sexual harassment. It will also provide confidence to victims to come forth and register their complaints no matter how personal.

The Committee shall have the following functions:

- To keep a live register of all grievances lodged by complainants;
- To provide support to affected communities on issues arising from environmental or social impacts;
- To record grievances of the affected community by categorizing and prioritizing them, and providing solutions within a stipulated time period;
- To report to the aggrieved parties regularly and in a timely fashion, developments regarding their grievances and decisions of the GRC.
- To escalate any unresolved issues to the management in a timely fashion so that solutions are reached in good time.

Training Workshop

The project proponent shall hold a training workshop for stakeholders (workers and community members) to educate and sensitise them regarding the operations of the GRM. This training shall be carried out before rolling it out so that the team is ready to receive and resolve grievances immediately stakeholders get to know of its existence.

Receiving and Recording of Grievances

The Grievance Officer (Proponent E & S Officer) shall receive anonymously record the grievance in a grievance form and assess the type of grievance.

If it is an issue that can be resolved immediately then a solution shall be provided by the Grievance Officer. If it requires deliberation of the GRC then the Grievance Officer shall indicate the timeframe when the complainant should expect the issues to be resolved.

The Grievance form that shall be used to record grievances shall contain the following information:

- Unique Serial number of the complaint;
- Date of receipt of the complaint;
- Particulars of the complainant (Name, Address, Contact details);
- Nature of Complaint (Subject of the complaint, Brief description of the complaint, where the issue occurred and when, suggestion on what the complainant wants done).

GRC Reports

The GRC shall prepare detailed monthly reports that shall be submitted to the management. The reports shall contain the following among other issues:

- The grievances recorded during the reporting period
- The resolutions provided to the complainants
- The period taken to resolve the issue
- The response received from the complainant after receiving feedback from the GRC
- Escalated Grievances and the timeframe taken to provide solution from the management
- Classification and Analysis of the grievances for lessons learnt and improvement of project operations
- Minutes of all the meetings of the GRC.

8.9. Framework for Implementation of the ESMP

The Contractor will be expected to address all aspects of the construction activities in compliance with all laws and regulations, approvals, licenses and permits which are applicable to the proposed project. The Contractor shall ensure that he is familiar with the ESMP for the project. He shall prepare the work plan and strategy taking into account the relevant provisions of the ESMP. The prepared Management plans shall be reviewed and approved by Environment and Social Safeguards Officer of the project implementor.

The Contractor will also be expected to evaluate the construction activities/components and prepare appropriate project Construction Environment and Social Management Plan including:

1) Waste Management Plan;
2) Biodiversity Management Plan
3) Hazardous Waste and Materials Management Plan;
4) Occupational Safety and Health Management Plan (OSHMP)'
5) Traffic Management Plan;
6) Water Management Plan
7) Community Engagement Plan;
8) Child Protection Strategy;
9) Workers Code of Conduct;
10) Labour Recruitment and Migrant Labour Management Plan;
11) Grievance Redress Mechanism;
12) Prevention and Protection Against GBV and Sexual Exploitation;

8.9.1. Institutional Framework for implementation of ESMP

Project Proponent Obligations & Responsibilities

KIWASCO has environmental and social safeguards team who will monitor the implementation of the ESMP. Project proponent will maintain a monitoring and oversight capability to ensure that the contractor and its subcontractors are fulfilling their E&S obligations. Responsibility for implementing the environmental and social mitigation and monitoring actions included in the ESMP will be passed on to contractor and its constructors.

Contractor upon issue of the 'notice to proceed' (NTP).

Proponent will:

- ensure that contracts with contractor and its sub-contractors are consistent with the components of the ESMP that are within their scope of responsibility and have the capacity to fulfil these requirements.
- review CESMP, including standard environmental and social protection procedures prior to starting construction; and
- maintain oversight of their ESMP performance. A monitoring process to track the contractor's compliance with the approved CESMP will be implemented during construction phase and the results reported.

Contractor Obligation and responsibilities

During the construction phase, responsibility for many of the environmental and social mitigation and monitoring actions will be passed on to the construction contractors. In these situations, Proponent will maintain a monitoring and oversight capability to ensure that contractors are fulfilling their obligations.

Contractor and their sub-contractors will prepare a CESMP, which will include:

- Sub plans for environmental management in line with the project ESMP as well as the mitigation measures proposed in the project EIA and any conditions imposed by NEMA to the potable water networks project.
- Site specific plans to apply in the field, including EHS Plan, emergency response and contingency plans, as appropriate; and
- proposed mitigation programme for identified sensitive areas (i.e. Impala Sanctuary Park).

8.9.2. Organization Roles and Responsibilities

The Contractor will be expected to engage the following safeguards officers on a full-time basis for the period of the project.

- EHS Expert (Environmentalist);
- CLO (Community Liaison Officer – Community Representative).

Before commencement of construction process, the Contractor will be expected to show familiarity with the methodology on the implementation of Environmental and Social Safeguards.

The above officers will have the responsibility of assisting the Contractor to comply with the safeguard’s requirements. Among other duties, the safeguards officers will be responsible for carrying out roles as listed in Table below.

The Safeguards Team will be reporting to the Project Manager/Supervisor on Safeguards achievements, issues and challenges on regular basis.

Table 25: Roles of Safeguards Officers Engaged by the Contractor

Title/Designation	Duties/Roles
EHS Officer	• Assist the Contractor to Develop CESMPs • Supervision of Health and Safety and implementation of Tool Box Talks • Implement Environmental Safeguards in the project to protect people and the environment • Ensure timely approvals and permits, wherever required • Coordinate environmental compliance in the project • Oversight waste management • Ensure environmental information reaches team leaders • Carry out surveillance on safety issues and safety training • Interface between the Contractor and the workers and Community • Support on social safeguards and helps mobilize and organize Community and other stakeholder meetings. • Record incidences taking place during construction work and liaises with the Project Supervisor to address the emerging issues. • Record Grievances • Assist the Grievance/EHS Officers with communicating safeguards issues to the community • Attend Grievance Redress Committee (GRC) Meetings • Preparation of Environmental, Health and Safety Reports

8.9.3. Training, Education and Competency

Site Supervisor shall ensure that every employee/worker (direct or contractual) is aware of the EHS risks associated with the work being carried out at the site and is trained and competent in the relevant work practices and maintenance procedures. Training needs shall be identified and executed to ensure all staff are provided with adequate safety training for all levels of employees. The safety training should provide staff with the knowledge and skills necessary for organizing and managing occupational safety and health programmes. The team leaders with leadership skills and knowledge to lead should be supported to implement and apply occupational safety and health activities. Workers with the knowledge, skills and right attitudes should be encouraged/supported to enable them to work safely.

Areas that could be considered for training of various cadres of workers are:

- HSE Policy and how it applies to the workplace;
- Hazards/Risks and Emergency Response Procedures;
- Importance of Safety Induction and Toolbox Talks;
- Appropriate use of Personal Protective Equipment (PPE).

The above inductions and trainings will improve on competency of the workers and lower incidence of injury and improvement on working safely.

8.9.4. Assessment and Improvement

It is noted that often projects collect data on environment, safety and social aspects of the project however this data is never evaluated for improvement on the implementation of the ESMP. Data on injury incidences should periodically analysed considering source of injury, frequency of occurrence and whether any safety measures were overlooked so that improvements can be made on lessons learnt.

8.9.5. Incident Management

All incidences occurring within the project shall be managed through the incident management procedure that has been put in place and conforms with DOSHS. Every team that is carrying out a task must have a person appointed to be in charge. The officer in charge shall be familiar with all incident management protocols All the procedures for different occurrences shall be documented using appropriate forms as guided by DOSHS. Team leaders shall be sensitized on the use of the forms and the required protocols of reporting incidences and timeframe in which all incidences must be reported. The incident reporting forms must always be within reach of the team leader or EHS Officer.

8.9.6. Reporting

It should be ensured that provisions for reporting incidents, accidents and dangerous occurrences during construction are promptly done using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO). The team leader or Officer in charge of a Task Team shall be inducted on the reporting protocols and requirements. The training or induction shall include:

- Procedure of making a report on incidences;
- The protocol to be followed and reporting hierarchy;
- How the forms should be filled (without errors or omissions);
- Reporting timeframe.

8.9.7. Management Review

The project Environmental and social Management and Incident reports shall be prepared and submitted on a monthly basis. Review by management shall be done on a quarterly basis and feedback given to the safeguard's teams.

8.9.8. Liaison and Communication to Stakeholders

Regular transparent communication between the project and the community and other stakeholders and vice versa is critical in building a good understanding between the parties involved. This good understanding shall be very important in managing unexpected situations that might arise during project implementation.

9. CONCLUSION AND RECOMMENDATIONS

9.1. Conclusions

The Project will directly contribute in achieving vision 2030 through increased water supply. It will improve the economic development in Kenya through the availability of good quality water supply and creation of employment.

The Project's impact on the physical environment will be manageable, mostly short-term construction-related impacts, which will be mitigated. The report has outlined mitigation measures in the ESMP matrix in chapter 8 to be implemented during the various project phases.

Given that the Environmental Assessment undertaken under this Project, and considering the Project's strong economic justification, the Project satisfactorily meets environmental protection requirements provided that the mitigation, monitoring, and reporting plans are carried out.

The environmental, and social Impact Assessment (ESIA) of the proposed project has been conducted in accordance with national legislative requirement, county by-laws; World Bank Operational Policies; and World Bank Group/IFC EHS guidelines. The ESIA study has been carried out based on the site visit, baseline environmental and social condition survey including Ecological Study on biodiversity, stakeholder consultation, analysis of the possible project intervention. The experts identified and evaluated potential environmental impacts associated with all aspects of the proposed project.

The key potential environmental impacts due to the project construction as established by the ESIA study are some losses of vegetation, air and noise pollution, moderate loss of habitat for some mammals, insects and amphibians, solid waste generation and disposal, increase in traffic and occupational health and safety. The economic opportunities in terms of local employment and provision of services during construction and operation phases are assessed as positive impacts. During the operation of the proposed project, the key issues related to the environment has been identified from the ESIA study are ecological, visual impact and occupational health and safety.

The Environmental and Social Management Plan (ESMP) has described mitigation measures for impacts specific to the project activities and also discuss implementation mechanism for recommended mitigation measures along with a monitoring plan. Implementation of the ESMP will help the proponent to comply with the national regulatory framework as well as to meet World Bank Operational Policies.

9.2. Recommendations

The following are also recommended with respect to the proposed Project.

- That strict adherence to the Environmental Management Plans should be observed;
- That any unforeseen impacts shall be immediately notified to the environmental assessor to ensure that they are immediately addressed and mitigated;
- Project Construction works to commence after approval and issuance of the license;

- The project contractor shall need to hold meetings with local communities before commencement of construction to firm up agreements of engagement.

APPENDICES

Appendix A- Minutes of the Community Meetings

MEETING 1:

MINUTES OF PUBLIC CONSULTATION MEETING FOR ESIA STUDY FOR THE PROPOSED INTERVENTIONS FOR KISUMU WATER AND SANITATION COMPANY LTD HELD ON 3/08/2024 IN GUBA KAJULU AT 2:00PM

Date:	3/08/2024
County:	Kisumu
Location:	Kisumu East
Meeting Venue:	Guba Open ground
Starting time:	2:00 pm
End time	4:30 pm
Participants:	**Male:** 38 **Female:** 21
Project representatives Present:	• Susan OKisa ESIA Consultant representative • Teresiah Ochieng Research Assistant • Bonn Alila Lake Victoria Water Department (LVWD) representative • Bramwel Ouma: GS-A (KIWASCO) • Bridgit Okwiri – Assistant Liaison (KIWASCO) • John Otieno – Zonal Coordinator (KIWASCO) • Jack Sirengo – Liaison (KIWASCO)

1

1. Agenda of the Meeting

The agenda was as follows:

1. Opening remarks/prayer
2. Introduction of participants
3. Overview of the agenda of the meeting
4. Project Description
5. Question and answer session
6. Closing and adjourning of meeting

2. Commencement of the Meeting

The meeting was opened by Jack Sirengo who in turn requested Pastor Kaleb Owino to open the meeting with a prayer. Following the prayer, Jack Sirengo introduced the Area Chief, Aloice Ouma, who proceeded to state the agenda of the meeting, highlighting it as a public participation meeting.

The Area Chief then introduced the area leadership before inviting representatives from KIWASCO and ESIA Consultant to take over the meeting. Jack Sirengo resumed the session and introduced the KIWASCO team, the Lake Victoria Water Department (LVWD) team, and the ESIA Consultant team from the Water Sector Trust Fund (WSTF).

After the introductions, Jack Sirengo explained the objectives and agenda of the project, including the Environmental Impact Assessment (EIA). He noted several key points:

- The project will result in noise and air pollution during its commencement.
- There are dangers associated with open excavations left behind.
- Minutes will be taken, and a report will be written based on the public participation feedback.

Jack then invited the LVWD team, led by Samuel Abogo, to explain their involvement in community projects. Samuel Abogo outlined their role and assured the residents of LVWD's presence whenever a new project is introduced in the area, which the residents agreed to.

3. Project Description (KIWASCO Technical Team)

Following this, Jack Sirengo invited the KIWASCO technical team to explain the project details. Bramwel Ouma (KIWASCO Technical Team) explained that the project runs from Wathorego market to Ketunga dispensary and another section to Guba, covering a distance of 8.4 kilometres. He also mentioned that the project has received a conditional liquidity fund.

The area has been experiencing issues with the old, dilapidated metallic pipe networks, leading to frequent supply failures, leaks, and bursts.

- The new project aims to provide a reliable and affordable water supply to all affected members.
- The current water infrastructure within the area is old, causing continuous water supply challenges. The new project will improve water reliability and quality.

At the end of his explanation, he asked the residents if they agreed to the project and its implementation, to which they consented.

4. ESIA Process (WSFT Consultant Representative)

The ESIA consultant representative outlined the ESIA process as mandated by the Environmental Management and Coordination Act (EMCA) of 1999 (amended in 2015), which requires a Full ESIA Study for significant projects. This study involves in-depth analysis of potential environmental and social impacts and the development of mitigation measures. Stakeholder consultation, essential for the EIA Study and supported by the Constitution of Kenya 2010 and the Public Participation Bill of 2018, is conducted to incorporate community input. After the ESIA Report is completed, it is submitted to the National Environment Management Authority (NEMA) for review and licensing. The consultant emphasized the importance of minimizing negative environmental impacts and maximizing positive outcomes through appropriate measures.

5. Interactive Session with Participants

- The meeting then progressed to an interactive session whereby the participants were given the opportunity to ask questions, make comments, seek clarification, air their views, concerns and recommendations for incorporation into the project development.
- There was confusion with a similar project that is ongoing with LVWD under the Chinese contractor. However, the technical engineer of LVWD, Bonn Alila, was able to clarify and differentiate the two projects.

The participants raised the following issues:

Participant Name	Gender	Identity Card	Issue Raised	Responses
Jane A. Opiyo	Female	8188136	The area population is increasing but water is scarce.	To address the increasing population and water scarcity, the project will expand the water supply infrastructure. This includes upgrading existing pipes and installing new ones to enhance distribution and capacity. We aim to provide a reliable and consistent water supply to meet future demands.
Margaret Awino Otieno	Female	26181527	Women wake up in the middle of the night to queue in order to fetch water which they barely get.	We recognize the inconvenience faced by residents. The new water project will include the construction of additional water points and storage facilities to reduce wait times and improve access to water throughout the day.
Samson Okumu	Male	2606460	Suggested that local skills are included during the project.	We will recommend to the contractor to consider including local skilled workers in the project. This will involve hiring from the local community and providing training opportunities to ensure that local expertise is utilized and local employment is supported throughout the project.
Edward Amonde	Male	2587568	Suggested that structures on the roads that will be damaged will be compensated.	We will conduct thorough assessments of any damages to structures caused by the project. Appropriate compensation will be provided based on these assessments to ensure that affected parties are fairly compensated.
Jacob owino	Male	23201520	The project may disrupt local businesses during construction.	We will recommend to the contractor to develop a detailed construction schedule and communicate with business owners to minimize impact. We will also implement measures to ensure that construction activities are conducted efficiently and disruptions are kept to a minimum.

Participant Name	Gender	Identity Card	Issue Raised	Responses
Jane A. Opiyo	Female	8188136	The area population is increasing but water is scarce.	To address the increasing population and water scarcity, the project will expand the water supply infrastructure. This includes upgrading existing pipes and installing new ones to enhance distribution and capacity. We aim to provide a reliable and consistent water supply to meet future demands.
Margaret Awino Otieno	Female	26181527	Women wake up in the middle of the night to queue in order to fetch water which they barely get.	We recognize the inconvenience faced by residents. The new water project will include the construction of additional water points and storage facilities to reduce wait times and improve access to water throughout the day.
Samson Okumu	Male	2606460	Suggested that local skills are included during the project.	We will recommend to the contractor to consider including local skilled workers in the project. This will involve hiring from the local community and providing training opportunities to ensure that local expertise is utilized and local employment is supported throughout the project.
Edward Amonde	Male	2587568	Suggested that structures on the roads that will be damaged will be compensated.	We will conduct thorough assessments of any damages to structures caused by the project. Appropriate compensation will be provided based on these assessments to ensure that affected parties are fairly compensated.
Jacob owino	Male	23201520	The project may disrupt local businesses during construction.	We will recommend to the contractor to develop a detailed construction schedule and communicate with business owners to minimize impact. We will also implement measures to ensure that construction activities are conducted efficiently and disruptions are kept to a minimum.

Participant Name	Gender	Identity Card	Issue Raised	Responses
Victor Otieno Onwo	Male	32624719	Concern about potential environmental impacts of the new water project.	We will recommend to the contractor to ensure measures will be implemented to protect water sources from contamination. This includes proper handling and disposal of construction materials and waste, and ensuring that any wastewater is treated before discharge. The contractor will implement erosion control practices such as silt fences, sediment traps, and proper site management to prevent soil erosion and sediment runoff into nearby water bodies. Dust suppression techniques will be employed during construction to minimize air pollution. Regular monitoring will ensure that air quality remains within acceptable limits.
Ruth Alando	Female	11499416	Queried regarding the maintenance and long-term sustainability of the new water infrastructure.	Long-term maintenance and sustainability are key components of the project. We will establish a maintenance plan to ensure that the infrastructure is regularly serviced and remains functional.

6. Grievance Redress Committee

A Local grievance redress committee was constituted facilitated by the Area Chief. The committee composed of the following members:

1) Chairman – Area Chief, Aloice Ouma
2) Youth representative – David Ochieng
3) Women representative – Margaret Awino Otieno
4) Activist representative – Maurice Odhiambo Sungu
5) Vulnerable persons representative – Lawrence Ajulu

7. Closing and adjournment

Jack Sirengo (Liaison, KIWASCO) thanked the participants for creating time to attend the meeting. He said that the adjournment of the meeting did not signal the end of engagement. The participants were invited to share further comments and views via the address provided in the project background information document.

The Area Chief made his closing remarks by thanking the public for availing themselves for the meeting despite their busy schedules and for the contributions they had made on behalf of Guba community.

The meeting ended with a word of prayer from one of the residents: Zipporah Odongo.

Confirmation of Minutes

Minutes prepared by: SUSAN OKUSA Date 4/08/2024

Minutes confirmed by: Florence Auma Alal Date 5th/08/024

Position: CHIEF EAST KAJULU LOCATION SIAYA EA

PHOTOS OF THE PUBLIC BARAZA MEETING



Photo 1: Area Chief, Aluice Ouma addressing the meeting



Photo 2: Lake Victoria Water Department (LVWD) representatives in attendance



Photo 3: Maurice Sungu (LVWD representative) airing his concerns

	Photo 4: The stakeholders in attendance
	Photo 5: Stakeholder voicing his concerns
	Photo 6: Another stakeholder voicing his concerns

10



Photo 7: Another stakeholder voicing her concerns



Photo 8: Another stakeholder voicing her concerns

11

MEETING 2:

MINUTES OF PUBLIC CONSULTATION MEETING FOR ESIA STUDY FOR THE PROPOSED INTERVENTIONS FOR KISUMU WATER AND SANITATION COMPANY LTD HELD ON 2/08/2024 IN ARINA ESTATE AT 2:00PM

Date:	2/08/2024
County: **Location:**	Kisumu Kisumu East
Meeting Venue:	Arina community hall
Starting time:	2:00 pm
End time:	5:30 pm
Participants: **Project representatives Present:**	**Male:** 18 **Female:** 24 • Susan OKisa ESIA Consultant representative • Teresiah Ochieng –ESIA Consultant representative • Bramwel Ouma: GS-A (KIWASCO) • Bridgit Okwiri Assistant Liaison (KIWASCO) • John Otieno – Zonal Coordinator (KIWASCO) • Jack Sirengo Liaison (KIWASCO) • Erick Musingo Meter Reader (KIWASCO) • Emily Odiya – Meter Reader (KIWASCO)

1. Agenda of the Meeting

The agenda was as follows:

1. Welcome and Introduction
2. Purpose of the meeting
3. Project description
4. Environmental and Social Impact Assessment
5. Discussion
6. Closing Remarks

1

2. Welcome and Introduction

The meeting was opened by the estate organizing secretary, Kelvin Odhiambo. Dorah Makungu opened with a word of prayer. The estate organizing secretary then led in self-introductions of the leaders of the estate. He welcomed the participants to the meeting and invited the community to ask important questions and raise concerns that the community would have raised. He invited Bramwel Ouma to explain the purpose of the meeting.

3. Purpose of the meeting

Bramwel Ouma explained that the primary purpose of the meeting was to discuss the Environmental and Social Impact Assessment (ESIA) study for a new water infiastructure project. He outlined the following key points:

- A proposal for the project was made to secure funding, with Arina being a significant part of the project due to its existing challenges.
- KIWASCO faces issues with water pipe repairs and has noted that up to 40-50% of the water released into Arina is lost due to the outdated infrastructure.
- The new initiative aims to address these challenges by enhancing the reliability and affordability of water supply for all affected members. The current infrastructure is outdated, leading to challenges in maintaining a continuous water supply. The project is designed to improve the reliability of water delivery and enhance the quality of water available to the community.

4. Project description

The Bramwel Ouma made a brief description of the proposed project as to entail the following:

- The Arina Overhaul Works project is designed to address and rectify the significant water infrastructure challenges faced by KIWASCO within the Arina estate. The primary issue stems from the old and dilapidated water network system, leading to substantial water losses and reliability problems. The project has been proposed to secure funding and aims to enhance the efficiency, reliability, and affordability of water supply in the area.

- The existing network, including both 4-inch and 2-inch lines, is in poor condition and fails to meet the needs of the 560 households in the estate
- There are old Galvanized pipes that are difficult to access due to settlement and other infrastructural issues.

Bramwel Ouma then invited ESIA consultant to explain more on the importance of ESIA study

5. Environmental and Social Impact Assessment

- The ESIA consultant explained that the requirement for an ESIA is enshrined in the Environmental Management and Coordination Act (EMCA), 1999, (amended in 2015) which is the framework law on environmental management in Kenya. The Act provides for environmental protection through processes such as Environmental Impact Assessment, Environmental Audit and Monitoring.
- The Second Schedule of the Act identifies development of the proposed interventions as requiring EIA studies
- By way of consideration of the nature of anticipated environmental and social impacts in terms of severity, ease of reversibility, longevity and the geographical scope which may be impacted by the project, it has been determined the project to be subjected to a Full ESIA Study to enable an in-depth identification and analysis of potential impacts, and subsequent devising of appropriate mitigation and enhancement measures
- The ESIA process entails screening a project to determine whether an EIA is required or not, and if needed, the level of scrutiny (environmental assessment) that the project should be subjected to. Screening is following by a baseline and scoping study to determine the nature and magnitude of anticipated environmental and social impacts
- Stakeholder consultation is a key aspect of the EIA Study and, is anchored in the Constitution of Kenya 2010 and is also supported by the Public Participation Bill of 2018. It is therefore crucial that stakeholders in any given development are identified and engaged at various levels with an aim of obtaining their views, concerns, suggestions and recommendations, to be incorporated in the project.
- The consultant explained that it is for this reason that stakeholder engagement is

being carried out.

- The consultant explained that once the ESIA Report is submitted to NEMA, NEMA will then review the report and make a decision as to whether to issue an EIA license with conditions or not issue the EIA license.
- The consultant explained the impact of the project to the environment and the mitigation measures that will be taken to minimize the negative impact and maximize the positive impacts.

6. Interactive Session with Participants

- The meeting then progressed to an interactive session moderated by Bridgit Okwiri whereby the participants were given the opportunity to ask questions, make comments, seek clarification, air their views, concerns and recommendations for incorporation into the project development.

Table1: ISSUES RAISED AND RESPONSES GIVEN

Participant Name	Identity Card	Issue Raised	Responses
Sylvia Okeyo	23640243	What's the purpose of the project in simple terms, are Arina residents considered in the project?	The purpose of this project is to improve the water supply system in Arina. The area currently faces challenges due to an old and dilapidated water network, which results in significant water loss and unreliable supply. The new project aims to replace outdated pipes and infrastructure to ensure a more reliable and affordable water supply for all residents. Yes, Arina residents are considered in the project. Specifically, the project will address the issues of water loss and supply reliability by installing new, larger water lines along the roads. This will help manage the high-water loss rates currently experienced and improve overall water quality. The project will also include the removal of old, inaccessible pipes and reorganize the existing network to enhance service to the 560 households in the area.
Steve Omollo:	24277999	Timeline, proposed date, how is it going to be done? What's their plan when the project is going on? What's been done about the sewer line?	The project is currently awaiting the report from the National Environment Management Authority (NEMA) for public participation. The overall project duration is estimated to be up to 12 months. However, for a smaller area like Arina, the project should take approximately 1 to 2 months to complete. Once the NEMA report is received and public participation is conducted, the project will commence. The timeline and detailed steps will be communicated to all stakeholders. During the implementation phase, there may be temporary disruptions to water supply as the new infrastructure is installed. Efforts will be made to minimize inconvenience to the residents, and regular updates will be provided to keep the community informed about the progress and any potential impacts. Proper waste management practices will be implemented throughout the project to ensure minimal environmental impact and maintain the cleanliness of the area. The project will use hand-driven excavation and implement effective waste management practices, minimizing the environmental impact. Additionally, reorganizing the water lines to run along roads rather than between houses will reduce disruption and improve maintenance access.

Participant Name	Identity Card	Issue Raised	Responses
Dorah Makungu	13468464	Are you laying new pipes or renewing old ones	The project will address and reorganize existing old Galvanized pipes, which are currently inaccessible due to resettlement. Only the small iron pipes will be removed as part of this renewal effort. New HDPE pipes will be laid to replace the old and dilapidated network. The new infrastructure will include a 4-inch main line and 2-inch subfeeder lines.
Seth Warinda:	13231081	How long will take and will they have supply of water? In case there is devolution, how will they benefit, will residents be employed as well?	Temporary measures will be in place to ensure that the community continues to receive water. Scheduled interruptions will be communicated well in advance, and alternative water supply arrangements will be made where necessary. The project will create employment opportunities for residents. Local labor will be prioritized for various phases of the project, including excavation, pipe laying, and maintenance. This will not only provide job opportunities but also help in the economic development of the area.
Ann Ombewa:	0124875	Will the old meters that have been in service be replaced?	Yes, the replacement of old meters is currently ongoing, and all the old meters will be replaced.
Seth Warinda	13231081	Can the new line have tokens system like KPLC electricity?	This initiative is part of a pilot program that we are actively working on.
Nancy Amondi	22781922	Is the project necessary?	The current water supply system in Arina is unreliable, leading to frequent no-water situations. Upgrading the infrastructure will significantly improve the consistency and quality of water supplied to the community. The existing infrastructure leads to substantial water losses of up to 50%, which is unsustainable. By replacing the old pipes and reorganizing the lines, the project aims to reduce these losses, ensuring more efficient use of water resources.
Ojwang' Otiende;	28940613	How fast is KIWASCO going to deal with issues of sewer lines with regards to this new system?	KIWASCO acknowledges that addressing issues related to sewer lines, particularly in Arina, presents a significant challenge. The difficult access to sewer lines within the area hampers timely interventions. However, KIWASCO has outlined that it typically takes up to 12 working hours to address these issues.
Participant Name	**Identity Card**	**Issue Raised**	**Responses**

Kevin Siara	23096241	Worried about water disruptions during the construction phase.	Construction will be phased to minimize disruptions, and temporary water solutions such as water tankers and storage tanks will be provided if necessary. Residents will be notified in advance of any planned disruptions, and efforts will be made to schedule work during off-peak hours to reduce inconvenience. Additionally, a hotline will be set up for residents to report any urgent water supply issues during the construction period.
Stephen Omondi	22917409	Raised concerns about waste management during pipe replacement.	Waste management protocols will be strictly followed, including the proper disposal of old pipes and excavation waste. This involves separating recyclable materials, safely handling hazardous materials, and ensuring that all waste is transported to certified disposal facilities. Additionally, site clean-up will be conducted regularly to maintain a safe and orderly environment.

7

7. Closing and adjournment

The ESIA Consultant thanked the participants for creating time to attend the meeting. The Consultant said that the adjournment of the meeting did not signal the end of engagement. The participants were invited to share further comments and views via the address provided in the project background information document.

The Area Chief made his closing remarks by thanking the public for availing themselves for the meeting despite their busy schedules and for the contributions they had made on behalf of Arina community.

The meeting ended with a word of prayer from one of the residents: Dorah Makungu.

Confirmation of Minutes

Minutes prepared by: SUSAN OKISA **Date** 4/08/2024

Minutes confirmed by: SIMEON O. NYAKWAL **Date** 5/8/2024

Position: ASST. CHIEF - KALOLENI SUB-LOCATION

ASSISTANT CHIEF
KALOLENI SUB-LOCATION
KISUMU TOWN LOCATION
P.O. BOX 1021-40100, KISUMU
DATE: 5/8/2024

PHOTOS OF THE PUBLIC BARAZA MEETING



Photo 1: Area Chief addressing the public consultation meeting



Photo 2: ESIA Consultant representative making the presentation of the ESIA

9



Photo 3: KIWASCO representative responding to the stakeholders' questions



Photo 4: KIWASCO representative responding to the stakeholders' questions



Photo 5: The stakeholders in attendance

MEETING 3:

MINUTES OF PUBLIC CONSULTATION MEETING FOR ESIA STUDY FOR THE PROPOSED INTERVENTIONS FOR KISUMU WATER AND SANITATION COMPANY LTD HELD ON 2/08/2024 IN GUDKA ESTATE AT 9:00 AM

Date:	2/08/2024
County:	Kisumu
Location:	Kisumu East
Meeting Venue:	Gudka Open ground
Starting time:	9:00 am
End time:	11:00 am
Participants:	**Male:** 12 **Female:** 11
Project representatives Present:	• Susan OKisa ESIA Consultant representative • Teresiah Ochieng – Research Assistant • Bramwel Ouma: GS-A (KIWASCO) • Bridgit Okwiri Assistant Liaison (KIWASCO) • John Otieno – Zonal Coordinator (KIWASCO) • Jack Sirengo – Liaison (KIWASCO)

1. Agenda of the Meeting

The agenda was as follows:

1. Opening remarks/prayer
2. Introduction of participants
3. Overview of the agenda of the meeting
4. Project Description
5. Question and answer session
6. Closing and adjourning of meeting

1

2. Commencement of the Meeting:

- The meeting was opened by the Area Chief, James Charles Odondo who in turn requested Susan A. Owili to open the meeting with a prayer.
- He then proceeded to state the agenda of the meeting as a public participation meeting.
- The chief introduced the area leadership before inviting KIWASCO team and the consultant team to take over the meeting.

3. Project Description (KIWASCO Technical Team)

- After the introduction, Bramwel Ouma explained the project nature and its objectives and the positive and negative impact the project may impose on the community.
- The Gudka Overhaul Works project was proposed for funding purposes and Gudka was selected as part of the initiative due to the significant challenges faced by KIWASCO. These challenges include the dilapidated metallic pipe networks leading to frequent water supply failures, leaks, and bursts. The estate's current water infrastructure is old, causing continuous supply interruptions and low water quality.

Project Objectives:

- **RELIABILITY:** To ensure a more reliable water supply to the community.
- **AFFORDABILITY:** To make the improved water system affordable for all members of the affected community.
- **QUALITY:** To enhance the quality of water provided.

4. ESIA Process (WSFT Consultant Representative)

- The ESIA consultant explained that the requirement for an ESIA is enshrined in the Environmental Management and Coordination Act (EMCA), 1999, (amended in 2015) which is the framework law on environmental management in Kenya. The Act provides for environmental protection through processes such as Environmental Impact Assessment, Environmental Audit and Monitoring.
- The Second Schedule of the Act identifies development of the proposed interventions as requiring EIA studies

- By way of consideration of the nature of anticipated environmental and social impacts in terms of severity, ease of reversibility, longevity and the geographical scope which may be impacted by the project, it has been determined the project to be subjected to a Full ESIA Study to enable an in-depth identification and analysis of potential impacts, and subsequent devising of appropriate mitigation and enhancement measures
- The ESIA process entails screening a project to determine whether an EIA is required or not, and if needed, the level of scrutiny (environmental assessment) that the project should be subjected to. Screening is following by a baseline and scoping study to determine the nature and magnitude of anticipated environmental and social impacts
- Stakeholder consultation is a key aspect of the EIA Study and, is anchored in the Constitution of Kenya 2010 and is also supported by the Public Participation Bill of 2018. It is therefore crucial that stakeholders in any given development are identified and engaged at various levels with an aim of obtaining their views, concerns, suggestions and recommendations, to be incorporated in the project.
- The consultant explained that it is for this reason that stakeholder engagement is being carried out.
- The consultant explained that once the ESIA Report is submitted to NEMA. NEMA will then review the report and make a decision as to whether to issue an EIA license with conditions or not issue the EIA license.
- The consultant explained the impact of the project to the environment and the mitigation measures that will be taken to minimize the negative impact and maximize the positive impacts.

5. Interactive Session with Participants

- The meeting then progressed to an interactive session moderated by Bridgit Okwiri whereby the participants were given the opportunity to ask questions, make comments, seek clarification, air their views, concerns and recommendations for incorporation into the project development.

Table1: ISSUES RAISED AND RESPONSES GIVEN

Participant Name	Identity Card	Issue Raised	Responses
Naomi Shikuku	**25859489**	There is lack of water within the area already, how will they benefit from the new project that is coming up?	Water infrastructure within the area is old. Community is facing challenges of continuous water Supply due to old dilapidated network system. The new project will improve water reliability and quality improved.
		Suggestion: There should be gender balance while sourcing for local skills to work on the project.	We will recommend to the contractor to collaborate with local organizations and community groups that focus on gender equality and women's empowerment. These partnerships will help the contractor to identify and engage skilled women and ensure they have equal opportunities to participate in the project.
		Which safety measures will be taken during and after the project is being done?	Measures will be taken to minimize environmental impact, such as proper disposal of construction waste, protection of water sources from contamination, and dust control practices. All personnel involved in the project will undergo comprehensive health and safety training. This will include proper handling of equipment, emergency response procedures, and adherence to safety protocols. Construction sites will be secured with appropriate barriers and signage to prevent unauthorized access. Safety officers will be present to monitor and manage site activities. Traffic control measures will be implemented to ensure the safe movement of vehicles and pedestrians around construction zones. This includes clear signage, detours, and coordination with local traffic authorities. Regular updates will be provided to the community regarding project progress, potential disruptions, and safety guidelines. A dedicated contact point will be established for residents to report concerns or incidents.
		Will we experience water rationing with the new project?	While the project is ongoing, there may be planned interruptions to the water supply. These interruptions will be carefully scheduled and communicated well in advance to minimize inconvenience. Any disruptions are kept to the shortest duration possible. He added that with the upgraded pipes and improved infrastructure, they do not anticipate the need for water rationing. The new system is designed to meet the current and future demands of the community more efficiently. The ESIA consultant explained that they will recommend to KIWASCO to provide temporary water supply solutions, such as water tanks to ensure that residents have access to clean water during any planned outages.

Participant Name	Identity Card	Issue Raised	Responses
Dorcas Mugobi	22187145	How long will the project take?	The project can take up to 12 months, however, with the small area like Gudka, it should roughly take 1 month or 2.
Joseph Oriedo	8190484	How does the new project intend to deal with the stealing of meter boxes within the area?	It is upon the members to take care of their goods, they should create a chamber for the new meter boxes.
		Why does it take time to fix leakages within the area? Will we experience the same with the new project?	The current water supply system is old and has been subject to wear and tear over many years. Identifying and accessing the specific points of leakage in an aged and deteriorated network can be challenging and time-consuming. The new water pipes will be made from modern, durable materials designed to withstand wear and tear much better than the old system. This should significantly reduce the frequency of leaks and the need for repairs.
Samuel Akoko	11499766	How do you intend to make the project effective since some of the meter boxes are behind the houses?	There will be minimal distraction while installing the new meter boxes. The meter boxes will be accessible in front of the house to avoid disruption.
Emma Waithera	31007349	Will we experience recurrent bills left by previous tenants i with the new project?	The Landlord needs to take care of the water bill left by previous tenants. In case they experience such an issue, they should get to the office and air their grievances for better service.
		Does the new project assure of clean water?	For quality issue the project will be using High-density polyethylene (HDPE), which are known for their durability and resistance to leakage and seepage. By using HDPE pipes, the project aims to minimize the risk of contamination and ensure a more reliable and consistent water supply. The advanced material will help in preventing any seepage issues that could compromise water quality, making it highly unlikely for the water to become unsafe.
		While doing the project, in case of leakages, is it KIWASCO that will pay for it or the tenant?	If it is before the meter box, KIWASCO will handle any damages made during implementation.
		Why do you leave the water bill to go higher without taking care of it or informing the tenant?	It is upon the tenants to check and pay previous bills to avoid the recurring bills.
Millicent Omollo	32334780	How will the new system avoid sewer blockage that we are experiencing with the old water network?	This upgrade will include enhanced sewer lines and improved drainage systems that are better equipped to handle storm water and reduce the risk of blockages.

Participant Name	Identity Card	Issue Raised	Responses
Susan Owili	**11634289**	Why can't there be people on the ground to confirm the current bills have been paid by the moving out tenants?	It is the landlord's responsibility to handle it and ensure that before a tenant moves, there is no water bill.
		Suggestion: Whatever damage that has been done, they should reinstate before or after the intervention.	Before commencing the project, a thorough assessment of the existing conditions has been conducted. This included detailed documentation of the current state of roads, pathways, green spaces, and any other affected areas. Efforts will be made to minimize any potential damage during the construction process. This includes the use of protective coverings, controlled access points, and proper handling of materials. After the completion of the project, all affected areas will be reinstated to their original or better condition. This will include repairing and resurfacing roads and pathways, replanting green spaces, and ensuring that any public or private properties impacted are restored.
Francis Kizito	**6447040**	Why disconnect lines ever after payment has been done?	The disconnection is done when you're not able to pay. The charges for disconnection are very high.
Joseph Oriedo	**8190484**	There's a lot of dump along the meter lines. How do they intend to work on that?	Before initiating the overhaul of the water pipes, a thorough assessment of the affected areas has been conducted. This will help to identify the extent of dumping and prioritize clean up process. The consultant will recommend the contractor to collaborate with local waste management authorities to facilitate the removal of dumps along the meter lines.
Job Asila	**20294604**	How the village youth benefit from the project since the project will be done in their home area?	The project will require a workforce for various construction activities. Local youth will be prioritized for these jobs, providing them with immediate employment.
		Will the project upgrade the community?	By replacing the old, dilapidated network system, the project will ensure a more reliable water supply. This means fewer interruptions and a more consistent water flow for all residents, enhancing daily life and reducing the inconvenience caused by current system failures.

6. Grievance Redress Committee

A Local grievance redress committee was constituted facilitated by the Area Chief. The committee composed of the following members:

1) Chairman – The Area Chief James Charles Odondo
2) Youth representative: JAPHET MALIT
3) Women representative: NAOMI SHIKUKU
4) Activist representative: DENNIS ISEZIT
5) Vulnerable persons representative: LYDIA OLANDO

ASST CHIEF
MANYATTAIR SUB-LOCATION
DATE 5/8/2024

7. Closing and adjournment

The ESIA Consultant thanked the participants for creating time to attend the meeting. The Consultant said that the adjournment of the meeting did not signal the end of engagement. The participants were invited to share further comments and views via the address provided in the project background information document.

The Area Chief made his closing remarks by thanking the public for availing themselves for the meeting despite their busy schedules and for the contributions they had made on behalf of Gudka community.

The meeting ended with a word of prayer from one of the residents: Susan A. Owili

Confirmation of Minutes

Minutes prepared by: SUSAN OKISA Date 4/8/2024.

Minutes confirmed by: JAMES ODONGO. Date 5/8/2024

Position: SENIOR ASSISTANT CHIEF ASST. CHIEF MANYATTA 'B' SUB-LOCATION DATE

PHOTOS OF THE PUBLIC BARAZA MEETING



Photo 1: Public Baraza Meeting at Gudka Open ground



Photo 2: ESIA consultant explaining the nature of anticipated environmental and social impacts in terms of severity, ease of reversibility, longevity which may be impacted by the project.



Photo 3: KIWASCO representative addressing the baraza



Photo 4: KIWASCO technical team representative addressing the baraza

Appendix B-Attendance List

Appendix C-Businesses along the wayleave that will be impacted by the project



Kiosks along the road reserve in Arina Estate



Business along Impala Park Junction



Boda boda base infront of Tuffoam Mall



Grocery stall between Tuffoam Mall and KCB bank



Bodaboda base infront of KCB bank



Bodaboda base next to Post bank



Business lady at the path between Tivoli Centre and Rana AUTO Selection



Businesses at the path between Tivoli Centre and Rana AUTO Selection



Businesses between Sarova Imperial Hotel and Holiday Driving School and Computer College



Business found along the wayleave between national oil and khetias



Business found along the wayleave between Naivas Supermarket and Wineca salon spa and barber shop

Appendix D-Questionnaire Responses from Businesses along the Project area

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED INTERVENTIONS FOR KISUMU WATER AND SEWERAGE COMPANY (KIWASCO) FOR THE REPLACEMENT OF MILIMANI PIPE LINES (DN63, DN90 AND DN300).

QUESTIONNAIRE

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1. **Details of the respondent**

   Name of respondent: Richard Organization: Khetia's

   Phone No. 0729565814 ID No. 24796454 Designation: Manager

2. **Do you support the proposed project?** YES☑ /NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   The project will improve supply of water and also sanitation services.

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts

   Supply of water will be improved after completion of the project.

   (b) Negative Impacts

   - Excavations will cause pollution of environment.
   - During excavations, general movement of customers will be affected hence drop in businesses performance.

   What would you propose as measures to mitigate the above negative impacts?

   - Consider customers movement during excavations.

   Give any relevant additional comments

   - Excavation job can be done alternatively be done at night to minimise dust pollution.

(Signature)

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KSM VICTORIA SHANGP
KHETIA'S SUPERMARKET
DATE 4/08/21

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED INTERVENTIONS FOR KISUMU WATER AND SEWERAGE COMPANY (KIWASCO) FOR THE REPLACEMENT OF MILIMANI PIPE LINES (DN63, DN90 AND DN300).

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1. **Details of the respondent**

   Name of respondent: Rhonny Nyuidho Organization: DELI ENERGY

   Phone No. 0757127831 ID No. 21664889 Designation: Supervisor

2. **Do you support the proposed project?** YES ☑ /NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   This would improve in water supply

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts:

   It would create job opportunities

   (b) Negative impacts

   The project may affect ways to other jobs work places

   What would you propose as measures to mitigate the above negative impacts?

   Time frames for the project should be short

   Give any relevant additional comments

DELI ENERGY LIMITED
FAMILY SERVICE STATION
★ 17 JUL 2020 ★
P.O. BOX 00622,
NAIROBI

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1. **Details of the respondent**

   Name of respondent: Michael Muthui Organization: Sarova Imperial Hotel

   Phone No. 0711960623 ID No. 26790944 Designation: Hotel Engineer

2. **Do you support the proposed project?** YES ☑/NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   This will improve the efficiency of distribution to the Customers.

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive impacts

   Quick supply of water to Residents and easier connectivity without leakages & losses

   (b) Negative impacts - The dust during excavation
   - Period of the Project Completion
   - Effects on Road damage connecting to the Hotel
   - Cleaning of the areas affected by the civil works

   What would you propose as measures to mitigate the above negative impacts?

   - Enough team so that as they excavate pipes is laid out Covered immediately.

   Give any relevant additional comments

   - Secure any improvements done along the building to avoid damage/destruction.

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1. **Details of the respondent**

   Name of respondent: MICHAEL OCHIENG Organization: KCB BANK (K) LTD.

   Phone No. 0721614447 ID No. n/a Designation: BRANCH MANAGER.

2. **Do you support the proposed project?** YES ☑/NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   Efficient services.

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts

   Improved flow of clean water

   (b) Negative impacts

   Damaged pathways, ~~dista~~ inconvenience for road users.

   What would you propose as measures to mitigate the above negative impacts?

   Alternative routes/passages.

   Give any relevant additional comments

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1. **Details of the respondent**

   Name of respondent: MATRIO ZACHEUS Organization: MABZA COMPUTERS

   Phone No. 0733452913 ID No. N/A Designation: ICT OFFICER

2. **Do you support the proposed project?** YES ☑/NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   Will decrease no of leakages on the pipes and ensure no outage of water.

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive impacts

   Access to clean water

   (b) Negative impacts

   will affect businesses

   What would you propose as measures to mitigate the above negative impacts?

   working through the night

   Give any relevant additional comments

   N/A

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1. **Details of the respondent**

   Name of respondent: MOSES ANYANGO Organization: MAZLINE TECHNOLOGIES

   Phone No. 0727-358889 ID No. 22828031 Designation: SALES MANAGER

2. **Do you support the proposed project? YES ☑/NO ☐ (tick one)**

   Do you have any reasons for your answer above? Please state

   Because of leakage all the time.

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts

   Interfere with the businesses Acces to clean Water

   (b) Negative impacts

   Interfere with the business

   What would you propose as measures to mitigate the above negative impacts?

   I Suggest the work to be done at night **Give any relevant additional comments**

   N/A

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1. **Details of the respondent**

   Name of respondent: GEOFREY OTIENO Organization: CLEAN DEAL ACCESSORIES

   Phone No. 0721-522[illegible] ID No. 7375100 Designation: TECHNICIAN

2. **Do you support the proposed project?** YES ☑ /NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   over flow of waste in town

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts

   To make sure the town is clean

   (b) Negative impacts

   Interfere with business

   What would you propose as measures to mitigate the above negative impacts?

   The work should be done at night.

   Give any relevant additional comments

   N/A

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1. **Details of the respondent**

   Name of respondent: Brenda Achieng Organization: Cosmetic shop

   Phone No. 0703800264 ID No. 31566267 Designation: Business owner

2. **Do you support the proposed project?** YES ☑ /NO ☐ **(tick one)**

   Do you have any reasons for your answer above? Please state

   The project will improve water supply in Kisumu

3. **Please state any positive/negative environmental and social impacts caused by the proposed project.**

   (a) Positive Impacts

   Availability of clean water that is less contaminated ~~operate~~ by dirty pipes

   (b) Negative impacts

   The project will inconvenience free movement in the street

   What would you propose as measures to mitigate the above negative impacts?

   Create diversion or optioned pathways and temporary access bridges **Give any relevant additional comments**

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Appendix E: PAPs Register

Appendix F: BQ



BQ.xlsx

Appendix G: Maps Showing AC Pipes



AC 225mm Overhaul Map_compressed.pdf