Green Energy for Kenya

GEOTHERMAL DEVELOPMENT COMPANY

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED MENENGAI WEST GEOTHERMAL DRILLING PROJECT

STUDY REPORT

18 February 2019

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DECLARATION

Project Title: Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Declaration by the Consultant

I hereby certify that the information contained herein are true to the best of my knowledge and belief.

Signature of the EIA Registered Expert

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Declaration by Proponent

I hereby certify that the information contained herein is true to the best of my knowledge and belief.

Signature of Proponent

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EXECUTIVE SUMMARY

I. PREAMBLE

Geothermal Development Company (GDC) proposes to conduct a geothermal exploration-drilling program (the **Geothermal Drilling** project) in **Menengai West, Nakuru County**. The proposed project involves drilling geothermal exploration wells to evaluate the viability of commercial geothermal energy-fuelled electric power generation. **Log Associates Limited** was contracted by **GDC** to carry out **Environmental and Social Impact Assessment (ESIA) Study for the proposed project**. The primary purpose of the ESIA is to present a detailed analysis of the risks and impacts the proposed project would have on the existing environmental and social conditions in the proposed project area. Feasible mitigation measures are defined in the ESIA to avoid, minimize, or compensate for the impacts. The ESIA specifies the proposed mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the proposed mitigation measures.

II. BACK GROUND

GDC is mandated to develop at least 5,000MW of geothermal power by 2030. In Kenya, geothermal resources are spread across more than 14 geothermal prospects across the Rift Valley. This includes The Greater Menengai geothermal. The proposed Menengai West geothermal project is located west of the Menengai caldera. Geoscientific surveys including geology, geochemistry and geophysics were carried out by GDC where five (5) exploration wells were sited. Results indicate that Menengai West proposed project location may be hosting a high temperature geothermal system. Drilling in this field was scheduled to commence after acquisition of necessary permits and licenses

Financing of Menengai Geothermal drilling projects have been through the Government of Kenya i.e. Treasury through the Ministry of Energy and Petroleum (MoEP) and other Multilateral lending agencies/donors such as Africa Development Bank (AfDB), French Development Bank (AFD) among others. Most of these banks have led mission to Menengai to assess the viability of the project of which ESIA study report has been one of the key documents guiding their assessment.

III. RATIONALE FOR ESIA

The Environmental Management and Coordination (EMCA) Act, 1999 requires that an Environmental Impact Assessment (EIA) is undertaken for proposed activities that are likely to have a significant adverse impact on the environment and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The second schedule of the EMCA Act, 1999 provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority. The proposed Geothermal Drilling Project falls within the second schedule of the EMCA Act (Revised 2015) under '*Mining including quarrying and open cast extraction of Geothermal energy exploration and production*' and this is what informed this study report. The proponent has commissioned the Environmental and Social Impact Assessment study in compliance with the Act.

IV. STUDY OBJECTIVES

The main objective of the ESIA is to identify significant environmental and social impacts associated with the proposed project and recommend appropriate mitigation measures for integration in all phases of the projects cycle. The ESIA has generated an Environmental and Social Management Plan with detailed mitigation measures, responsibilities of such measures, estimated costs, and a detailed monitoring plan.

V. THE PROPOSED PROJECT DESCRIPTION

a. Proposed Project Location

The area referred to as "Menengai West Geothermal Prospect" is located west of the Menengai caldera in the Kenya Rift Valley. The proposed project area is located about 180 km Northwest of Nairobi, Kenya. The proposed project area is located along the Ol'Rongai Hills located on the western side of the Menengai caldera. The major market centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo. (Fig 0-1)

b. Proposed Project Description

The geothermal exploration program would include drilling deep geothermal wells. The approach for selecting the specific locations of exploration wells, including their depth and diameter, would depend on a range of factors such as access to funds, land accessibility, environmentally sensitivity, identification of feasible well pad locations, and eventual power plant development potential.

c. Drilling Process

Geothermal Exploration is normally a process conducted in phases. The drilling mechanism for the initial exploration phase consist of drilling exploratory wells in the resource target areas to evaluate sub-surface conditions and determine if there are indications of presence or absence of a commercially developable geothermal system. The well drilling results are evaluated before determining the next drilling location and well design. If exploratory drilling program indicates there may be a commercial resource, appraisal geothermal wells could be drilled in the potential area.

d. Well Drilling

The proposed project includes drilling exploratory geothermal wells at the potential drilling areas; however, the option for drilling appraisal wells is also likely to be included. For comparison purposes, the table below lists some of the key differences between slim-hole wells and full-sized wells.

Table 0-1:* Potential *Drilling Operations for larger diameter wells

Component	Full-sized larger diameter Wells
Well Pad Dimensions	100 x 100 meters (0.2 hectare) (330 x 330 feet; 0.5 acre)
Drill Rig Dimensions	20 x 10 meters (66 to 33 feet)
Minimum Access Road Width	6 to 7 meters (18 to 24 feet)

Well Diameter at Depth	7 inches
Target Depth	Varies, but could be estimated at between 2,000 to 3,000 meters (6,600 to 9,850 feet)
Estimated Water Demand during Drilling	Estimated at 20 to 30 liters per second (up to 45-90 days)
Drilling Materials	• Drilling mud/fluid • Casing • Cement
Drill Cuttings/Waste Storage	Lined sumps
Drilling Period	30 to 90 days (up to 24 hours per day)
Geothermal Resource Testing	Injectivity and production testing
Testing Period	Typically 30 to 90 days (if working up to 24 hours per day)

Sources: (GeothermEx and Power Engineers 2017)

e. Land Requirement

Based on ***Table 0-1****: Potential Drilling Operations for larger diameter wells*) above and also based on the discussion and consultations with the GDC field team during field inspection, the amount of land required for the well drilling and the pipeline way-leave has been determined. For purposed of geothermal exploration, a total area of 140m by 120m (i.e. equivalent to16,800 sq.m, or 4.15 acre, or 1.68Ha) was proposed. For the purpose of the study, the proposed well drilling site was taken as central point.

For the proposed water pipeline, which would deliver water to the proposed project sites, 9-metre way-leave (which already exists on roads reserves) was proposed. Most section of the wayleave are available through the public road networks serving the communities in the area, and therefore minimal private lands would be affected.

All private lands likely to be affected by the proposed project have been discussed in the *Land Acquisition and Compensation Plan (LACP) Report*, annexed to this Report.

f. Geothermal Resource Testing

Testing for the presence or absence of an exploitable geothermal reservoir will be conducted after each well is completed. Depending on the final depth and characteristics of each well, these tests would include downhole temperature measurements, injection testing or production testing. Temperature-gradient measurements will be completed periodically for weeks after completion, after the drilling rig is off the location. Wells that encounter elevated temperature and permeability at depth may be completed with a slotted liner. Short-term production and/or injection tests may be completed to assess sub- surface conditions. This testing will occur immediately upon completion of the well, and will require the drill rig to remain on site.

If larger diameter exploration, appraisal and production wells are drilled and successfully encounter the geothermal reservoir, well and reservoir testing would be conducted to analyze characteristics of the resource. One or more initial short-term flow tests would occur at each exploration well, and one or more long- term flow tests will occur after the completion of all wells to assess the productivity of the geothermal reservoir and to sample the geothermal fluid. One or more short-term tests will be conducted to test any shallow reservoir transected by the

wells. The well bore would ideally be cleared of all residual drilling mud and drill cuttings prior to conducting a well production test. A long-term flow test may be performed, if warranted, to measure the flow temperature, pressure, and chemistry over time. The decision to conduct a long-term flow test will depend on wellbore conditions, benefits from the data obtained, and casing integrity.

g. Well Abandonment and Site Reclamation

The commercial potential of each exploration and appraisal well would be assessed after testing. The well will not be abandoned if it is determined to have long-term use as a production well, monitoring well, or injection well. Equipment would be removed and the site cleared of excess material. The wellhead will remain in place for future testing, monitoring, or production.

If a well is not determined to have commercial potential, monitoring of the well may continue or the well may be abandoned. Well abandonment typically involves plugging the well bore with enough cement to ensure that fluid in the reservoir would not flow into different aquifers; the casing would remain in place. Any wellhead equipment would be removed from the well, and a metal cap would be welded to the casing. The well pad sites would then be graded as necessary to restore the sites to the approximate original topography and biological health.

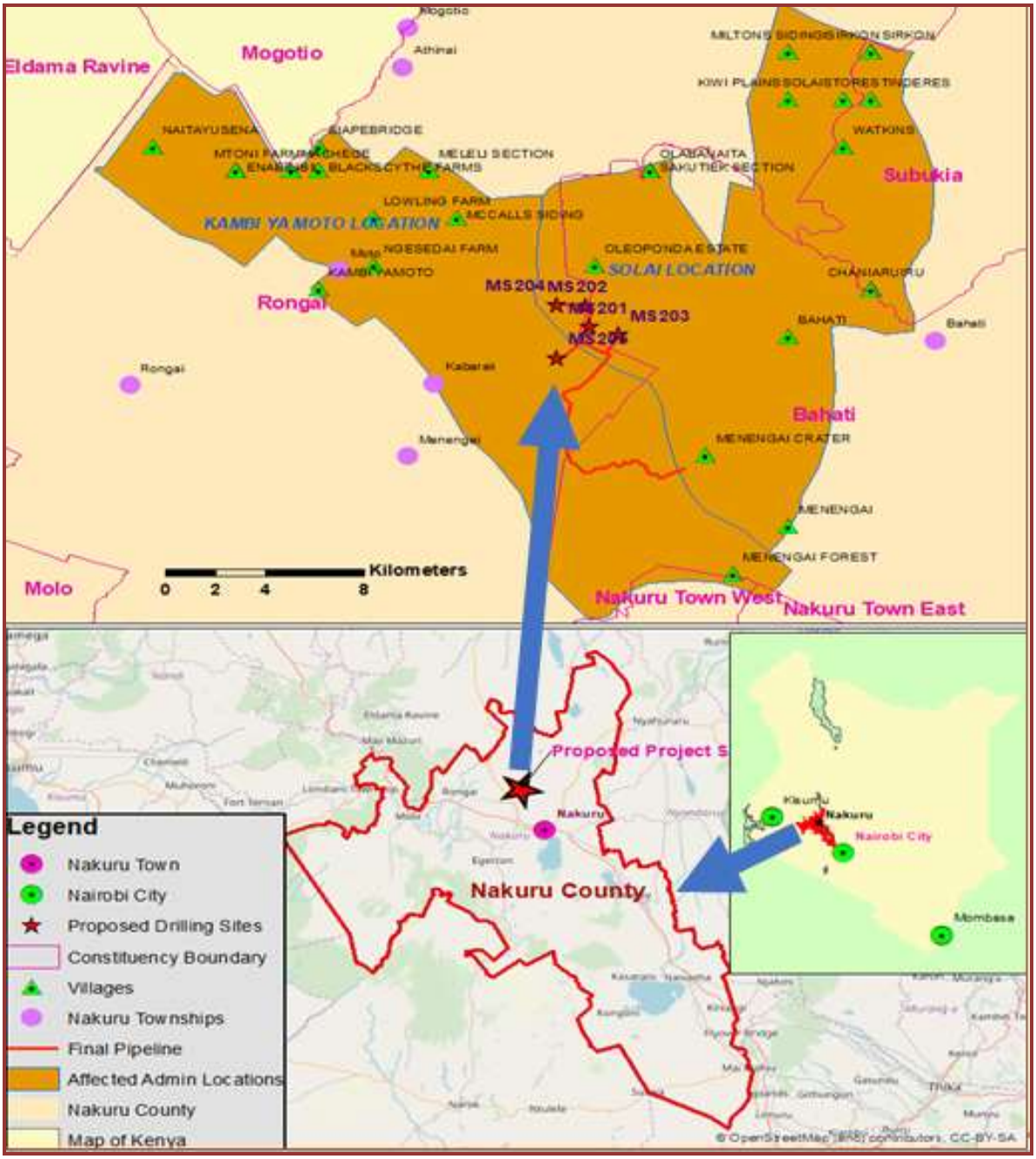

Figure 0-1: Map showing the proposed project location

VI. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This document has provided the legal, policy and institutional framework context for the ESIA, locally and internationally. It has identifies the Kenyan and International key legal and policy requirements. It has reviewed the AfDB, the World Bank and the French Development Bank's policies and guidance on environmental and social impact assessment.

VII. PUBLIC PARTICIPATION AND CONSULTATIONS

Several meetings *(Barazas)* were held through which stakeholders were consulted. The proposed project was discussed at length and various stakeholders including the community

members had input into the proposed project. The aim of the consultation was to ensure that the views of stakeholders and the interests of the communities were captured.

With the help of the National Government administration, County administration and local administrations (Area Chiefs, Sub Chiefs and village elders) community members were mobilized. The *Barazas* brought together representatives from the larger community including women, youth and persons with disabilities. The key issues discussed during these Barazas included:

- Knowledge of the community members regarding the proposed project
- Concerns of communities regarding the proposals
- Environmental and social issues pertinent to the proposed project
- Communities' proposals regarding possible CSR interventions
- Communities views regarding acceptability of the proposed project

The outcome of these meetings are detailed in Chapter 6 of this ESIA Report

VIII. POTENTIAL PROJECT IMPACTS

The following potential positive and negative environmental and social impacts are anticipated throughout the different proposed project development phases;

a. Potentially Beneficial Social Impacts

During civil works phase, the key positive impacts will include:

- The proposed project would provide opportunities for training and increased knowledge of geothermal drilling and testing
- Improved road infrastructure
- Creation of temporary local jobs during construction and drilling operations
- Employment opportunities for the construction staff
- The proposed project would also create good working conditions with fair employment practices in accordance with all laws and policies governing labour rights and working conditions.
- If the proposed project is successful, it could lead to development of a geothermal power plant to improve Kenya's reliance clean energy, and hence reduces emissions of pollutants
- It will improve income generation activities to the local communities through sale of local construction materials (from local shops and the numerous quarries)
- Improvement in local economy from increased trade activities
- Potential diffusion and transfer of knowledge from specialist construction staff to the local participants

b. Potential Negative Impacts

Anticipated Project Impacts shall be both positive and negative in nature. This report outlines how the positive impacts will be enhanced while also highlighting how the negative impacts will be mitigated. Proposed project may have the following negative impacts:

- **Archaeology and Cultural Resources:** In Kenya, Menengai West in Nakuru County, the area in which the proposed well drilling sites have been proposed, is not known (or famous) for significant amounts artefacts. However, both prehistoric and early colonial artefacts may not be completely ruled out. In this study, two sites are likely to be culturally sensitive. Specifically, the proponent should conduct additional surveys for archaeological and cultural resources prior to civil work activities in MS 202 and MS 205.

    i. MS 202 contains sensitive cultural resources, an individual grave. Any form of civil works, including grading and/or excavation activities at this site could impact negatively on the community. The grave, which was used after LACP cutoff date, is approximately 20m (twenty meters) from the center of proposed drilling well site. Handling of grave will involve relevant stakeholders so as not to infringe on religious, traditional and cultural beliefs. Mitigation measure includes extensive consultation with the affected family, the community and the relevant church. If possible (since there is adequate uninhabited land around the proposed well site) re-engineering and slight relocation of proposed project component such as well pads, ponds and other components away from the grave. This would be the most recommended scenario that would include fencing-off and protecting the grave, and leaving it undisturbed.

    If the grave must be relocated, the proponent should follow all procedures for relocation of grave. Official notice would have to be given to interested parties, it would be done:

    1. With due regard to the views of the persons interested and the religious susceptibilities of the members of the religious community to which the person belonged whose grave or dead body it is;
    2. In a manner which is not injurious to public health;
    3. In accordance with such directions as may be given by the public officer appointed to supervise the undertaking; and
    4. Accompanied by such religious rites or ceremonies as are appropriate to the religious community to which the person belonged whose dead body is removed.

    GDC should carry out consultative meetings with the affected people, families, religious institutions, and local authorities on modalities of grave relocation and taking into consideration laws on cultural preferences and wishes of families. GDC to consult with Ministry of Health, Internal Security as well as the County Government of Nakuru.

    ii. The proposed site MS 205 was found to have place of worship just outside the proposed project perimeter. The layout of the project site should consider the church. In addition, the proposed site covers a derelict quarry land.

    If any sensitive resources are discovered, the resources shall be evaluated to determine appropriate treatment or avoidance procedures. If the sites contain resources or if inadvertent discoveries are made during construction, the testing and monitoring provisions detailed in in this report shall be implemented, as determined necessary by the archaeologist and GDC.

- **Soil Erosion and Water Quality.** The proposed project would require grading roads and well pads, which could mobilize sediment and impact water quality. The drill cuttings could contain high levels of heavy metals. Implementation of sediment and erosion control best management

practices, testing drill cuttings, testing surface and ground water quality, and implementing protective and remedial actions (if necessary) will protect water quality during drilling. Site restoration/reclamation activities will restore the well pad and avoid long-term soil loss.

- **Water Supply.** Transportation of the heavy machinery and the constructing access roads and the water pipelines could impact water supply infrastructure, such as buried pipelines. Avoiding water supply infrastructure through consultation and coordinating with Nakuru Water and Sewerage Service Company (NAWASSCO) will avoid significant impacts on water supply.

- **Air.** Geothermal testing could result in a temporary increase in carbon dioxide (CO2) and hydrogen sulphide (H_2S) levels in proximity to the wells. Air quality will need to be monitored and emergency evacuation procedures would be implemented if CO_2 or H_2S levels exceeded standards at receptors. The risk of exceeding air quality standards is low and would most likely be attributed to an upset condition, such as a well blowout (which is rare). Any potential exceedance of air standards would be short in duration because the geothermal gases would disperse quickly after the geothermal gases are contained. The mitigation would adequately manage the risk of geothermal gas emissions.

- **Geologic Hazards.** Widening roads at sharp turns could cause a landslide if the roadway is not properly constructed. One of the drilling areas (MS 205) is located in an area with saturated soils and abandoned quarry. The slope is steep, and there are people residing approximately 200m from the proposed site. Before drilling, the Civil Works contractor should conduct a geotechnical investigation to investigate any potential for induced slope stability, landslide risk, and unstable soil conditions and address the issues accordingly. The risk of slope failure or subsidence would be mitigated through implementation of the geotechnical recommendations proposed in this document. The mitigation would adequately manage the risk from geologic hazards.

- **Noise.** Operating construction and drilling equipment would result in a temporary increase in noise in proximity to the well pads. Well drilling (and potentially well testing) would occur 24 hours a day and could result in elevated noise levels at residences near the drilling sites. The mitigation includes installing noise control devices on the drilling equipment, noise barriers where drilling would occur, and a mechanism to receive and respond to noise complaints. The mitigation would adequately manage temporary noise impacts.

- **Impact on natural sources of construction materials:** The contractor, in consultation with GDC shall obtain appropriate authorization including from NEMA, WRA and Mines and Geology department to do or use any proposed borrows pits and quarries. These will be obtained before commencing activities; Any new borrow pits and quarries shall be located more than 100 meters from watercourses in a position that will facilitate the prevention of storm water runoff from the site from entering the watercourse;

- **Natural Habitats and Biodiversity.** All the proposed project areas would be positioned in open agricultural or previously disturbed areas absent of natural and sensitive habitats. Project noise could impact bird nesting behaviour in vegetated habitat adjacent to the drilling areas. Mitigation includes buffers from the vegetated habitat and pre- construction surveys for sensitive bird species. The mitigation would adequately manage the risk to biodiversity.

- **Landscape and Visual Quality.** The proposed project area is outside of the key tourist destinations and would not be in view from established tourist viewpoints. All the drill rigs and equipment would have a minor and temporary impact on landscapes and views. However, grading and vegetation removal during access roads and well pad establishments could impact the

landscape. Mitigation includes restoration of the well pads and revegetation after the project is completed. Implementation of site restoration would adequately manage this risk.

- **Traffic and Road Safety.** The proposed project will include transporting large equipment to the drilling areas. Temporary lane closures may be required during equipment transport. Mitigation includes use of traffic controls and flaggers. The mitigation would adequately manage the risk on traffic and safety.

- **Utilities.** Transporting large equipment could damage low-hanging utility lines. The mitigation requires minimum clearance for overhead utilities or temporary relocation of the line. The mitigation would adequately manage the risk on utilities.

- **Fires.** Construction equipment, welding, or worker smoking could ignite a fire in brush near the work sites. Mitigation includes worker training and maintaining fire suppression equipment at the work sites. The mitigation would adequately manage the risk of wildfire.

- **Waste.** The proposed project would generate non-hazardous waste from packaging, containers, and the worker camp. The construction equipment would also require the use of small quantities of hazardous materials, such as fuel, oils, and lubricants. Drilling will produce drill cuttings that will be tested and buried on site if non- hazardous; any hazardous drilling waste would be removed and disposed of in an appropriate facility. Produced geothermal fluids (if the well encounters the geothermal resource) would be contained in pits or tanks. Effluent (liquid waste) from drilling activities would be tested and disposed of appropriately. Mitigation includes preparation and implementation of a waste management plan and hazardous materials management plan to adequately manage the risk from solid, liquid, and hazardous waste.

- **Livelihoods and Resettlement.** The proposed project will require resettlement of few structures and people. In addition, portions of the proposed project are located in areas where active agriculture production occurs, and the proposed project could temporarily impact the livelihoods of individual farm owners and farmworkers. Mitigation includes compensation for loss of properties and agricultural production in accordance with the Resettlement Action Plan Policy (Refer to Appendix III, Land Acquisition and Compensation Plan). The mitigation would adequately manage the impact on livelihoods.

- **Health and Safety.** The proposed project would expose workers to occupational hazards associated with heavy equipment, the drill rig, and potentially production of geothermal steam and hot water. Workers would also be at risk of exposure to geothermal gases including H_2S and CO_2. The mitigation includes a worker safety program and worker safety training. The mitigation would adequately manage the risk to health and safety.

IX. SUMMARY OF MITIGATION MEASURES

Table 0-2: Summary of Mitigation measures

Resource	Mitigation
Air Quality	• Air-1: Fugitive Dust Management • Air-2: Construction Emissions Controls • Air-3: Air Quality Monitoring and Noxious Gas Management
Community Health and Safety	• Safety-4: Community Safety
Fires Geology and Soils	• Fires-1: Fire Prevention and Response • Soils-1: Topsoil Preservation and Restoration

Resource	Mitigation
	• Soils-2: Geotechnical Investigation
Hazards and Hazardous Materials	• Hazards-1: Hazardous Materials Management Plan
Landscape and Visual Character Landscape	• 1: Site Reclamation and Restoration
Livelihoods	• Social-1: Compensation for Loss of Agricultural Production
Natural Habitats and Biodiversity	• Biodiversity-1: Destroy Vegetation only when inevitable • Biodiversity-2: Invasive Weed Control • Biodiversity-3: Nesting Bird Avoidance and Impact Minimization
Archaeological and Cultural Resources	• Cultural-1: Archaeological Testing or Monitoring, Implement a management plan • Cultural 2: Pre-Construction Surveys in MS-MS 202 and MS-205 • Cultural 3: Worker Cultural Resources Sensitivity Training
Noise	• Noise-1: Noise Abatement and Community Coordination
Solid Waste	• Waste-1: Waste Management Plan
Traffic Circulation and Safety	• Traffic-1: Traffic Control • Traffic-2: Road Hazard Avoidance
Utilities and Communication Systems	• Utilities-1: Protect Overhead Utility Lines
Water Resources	• Water-1: Storm water, Erosion, and Sediment Control • Water-2: Water Quality Monitoring Program • Water-3: Drilling Waste and Effluent Management • Water-4: Blowout Prevention • Water-5: Water Supply System Protection
Worker Health and Safety	• Safety-1: Health and Safety Plan • Safety-2: Personal Protection Equipment • Safety-3: First Aid and Emergency Response Equipment
Working Conditions and Equality	• Social-2: Working Conditions and Equality • Social-3: Community Engagement and Sensitivity

X. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

An Environmental and Social Management Plan (ESMP) has been developed for the proposed project in Chapter 9 of this report. This plan provides a logical framework within which the negative environmental and social impacts identified during the ESIA study will be mitigated and the positive impacts enhanced. Monitoring and management practices as well as monetary compensation are considered and cost estimates included. Responsibilities for the implementation of the various aspects of the ESMP have been identified. This plan shall be followed at all times during project implementation.

XI. CONCLUSIONS

All impacts associated with the proposed project could be minimised or mitigated by implementing the proposed mitigation measures identified in this ESIA. The proposed project would comply with all national and international policies, including the World Bank's Environmental and Social Policy for Investment Project Financing and Environmental and Social Standards (ESS) through implementation of the mitigation measures listed in chapter 8, Table 8-1, Table 8-2 and Table 8-3.

XII. RECOMMENDATIONS

- It is recommended that GDC develop and implement a community liaison strategy with proper communication and feedback mechanism; and a clear all community concerns as soon as they arise. The liaison staff should also be tasked to manage the local community expectations (through well- structured community SEP) by providing the correct position of the proposed project.
- The proposed ESMP should be adhered to the latter. GDC should regularly provide close monitoring to ensure that the contractors implement the plan, as scheduled.
- All stakeholders should be encouraged to participate in the implementation of ESMP. For instance GDC, and the WRA should undertake joint studies to investigate any possibility contamination of underground water aquifers (either through thermal or chemically) and institute appropriate mitigations where necessary.
- Ensure compliance with NEMA approval conditions throughout the project phases;
- Ensure compliance with the MOUs (agreements the communities, WRA, KFS, other interest parties) throughout the phases of the project to ensure smooth project implementation.

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LIST OF ACRONYMS

BMP	Best Management Practices
BOP	Blowout Prevention
CBD	Convention on Biological Diversity
DOSH	Directorate of Occupational Safety and Health
EA	Environmental Audits
EIAs	Environmental Impact Assessments
EMCA	Environmental Management and Coordination Act
ERC	Energy Regulatory Commission
ESAP	Environmental and Social Assessment Procedures
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EU	European Union
GDC	Geothermal Development Company
GDP	Gross Domestic Product
IFC	International Finance Corporation's
JICA	Japan International Cooperation Agency
KETRACO	Kenya Electricity Transmission Company Limited
KFS	Kenya Forest Service
km	Kilometer
KURA	Kenya Urban Roads Authority
kV	kilo Volts
KWS	Kenya Wildlife Service
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
MoEP	Ministry of Energy and Petroleum
MTP	Medium Term Plans
NEAP	National Environmental Action Plan
NEAPC	National Environment Action Plan Committee
NEC	National Environmental Council
NEMA	National Environment Management Authority
NET	National Environmental Tribunal
OP	Operational Policies
OPs	Operational Policies
OSHA	Occupational Safety and Health Act
PAPs	Project Affected Persons
PCC	Public Complaints Committee
PES	Payment for Environmental Services
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RoW	Right of Way
RPF	Resettlement Policy Framework
SCADA	Supervisory control and data acquisition
SDGs	Sustainable Development Goals
SEAs	Strategic Environmental Assessments
SERC	Standards and Enforcement Review Committee
SHE	Safety, Health and Environment
UNCCD	United Nations Convention to Combat Desertification

UNFCCC	Kyoto Protocol to the United Nations Framework Convention on Climate Change
WB	World Bank
WRA	Water Resources Authority

1 INTRODUCTION

1.1 Preface

Geothermal Development Company (GDC) proposes to conduct a geothermal exploration drilling program (the **Geothermal Drilling** project) in **Menengai West, Nakuru County**. The proposed project involves drilling geothermal exploration wells to evaluate the viability of commercial geothermal energy-fuelled electric power generation. **Log Associates Limited** was contracted by Geothermal Development Company to carry out **Environmental and Social Impact Assessment (ESIA) Study for the proposed project**. The primary purpose of the ESIA is to present a detailed analysis of the risks and impacts the proposed project would have on the existing environmental and social conditions in the proposed project area. Feasible mitigation measures are defined in the ESIA to avoid, minimize, or compensate for the impacts. The ESIA specifies the proposed mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the proposed mitigation measures.

1.2 ESIA Report Format

This report follows the format prescribed in the Legal Notice No. 101 of 13 June 2003, which deals with the Environmental (Impact Assessment and Audit) Regulations 2003. The ESIA report looks at the background of the proposed project; nature of the proposed project; activities of the proposed project; project design, materials and equipment to be used; potential environmental impacts; mitigation and enhancement measures; legislative and regulatory framework; prevention and management of possible accidents; health and safety issues; potential economic and social impacts; the budget; and proposes an environmental management plan for the proposed projects.

The ESIA has been prepared in accordance with EMCA act and in consideration of other relevant local and international laws, including The World Bank Environmental and Social Framework (World Bank 2017). The Report is organised as follows:

- **Chapter 1: Introduction.** Summarizes the purpose and contents of the ESIA, the Terms of Reference and the team composition.
- **Chapter 2: Proposed Project Description.** Describes the proposed geothermal exploration program in detail, including the specific locations, procedures, and scheduled of the proposed project.
- **Chapter 3: Legal, Policy and Institutional Framework.** Summarizes environmental and social laws that are applicable to the ESIA process.
- **Chapter 4: Baseline Information.** Summarizes the findings of the literature review and field studies presented in the Scoping Studies Report that was prepared for the proposed project.
- **Chapter 5: Analysis of Project Alternatives.** Summarizes alternatives that were considered and screened out when developing the proposed project description.
- **Chapter 6: Consultations and Public Participation:** Highlights the stakeholder engagements, consultations and description of participation and information dissemination from and to the community members and key stakeholders
- **Chapter 7: Environmental and Social Risks and Impacts.** Describes the specific risks and impacts that would result from the proposed project.
- **Chapter 8: Impact Mitigation and Enhancement Measures.** Provides the full text of mitigation measures that would implemented to avoid or minimize impacts, including the

specific tasks, roles, and responsibilities (e.g., GDC, civil works contractor, and well drilling/exploration contractor).

- **Chapter 9: Environmental and Social Management Plan: Highlights the key measures and actions for the environmental and social commitment plan.** Lists the important plans and actions that would ensure implementation of the required mitigation measures and compliance with the local and international polices and standards.
- **Chapter 10: Conclusions and Recommendations**

1.3 Background and Terms of Reference

Geothermal Development Company is mandated with development of **5,000MW** of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospects across the Kenyan Rift i.e. Menengai, Olkaria, Suswa, Longonot, Eburru, Arus-Bogoria, Lake Baringo, Korosi, Paka, Lake Magadi, Badlands, Silali, Emuruangogolak, Namarunu and Barrier – Kenya (Figure 1-1 below). The Greater Menengai geothermal project is among the more than 14 high temperature geothermal areas within the Kenyan Rift being developed by GDC for geothermal energy utilization.

Figure 1-1: Geothermal fields in Kenya

(Source: Proceedings World Geothermal Congress 2015)

The proposed Menengai West geothermal project is located west of the Menengai caldera. Geoscientific surveys including geology, geochemistry and geophysics were carried out by GDC where five (5) exploration wells were sited. Results indicate that the proposed project location may be hosting a high temperature geothermal system. Drilling in this field was scheduled to commence after

acquisition of necessary permits and licenses. In 2008, ESIA for Menengai Caldera Project area was done by NEMA registered EIA/Audit Team of Lead Experts. The project and ESIA reports were prepared and submitted to NEMA, which issued EIA License No. NEMA/EIA/VEIA/193.

Financing of Menengai Geothermal drilling project has been through the Government of Kenya i.e. Treasury through the Ministry of Energy and Petroleum (MoEP) and other Multilateral lending agencies/donors such as Africa Development Bank (AfDB), French Development Bank (AFD) among others. Most of these banks have led mission to Menengai to assess the viability of the project of which ESIA study report has been one of the key documents guiding their assessment.

The Environmental Management and Coordination (EMCA) Act, 1999 requires that an Environmental Impact Assessment (EIA) is undertaken for proposed activities that are likely to have a significant adverse impact on the environment and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The second schedule of the EMCA Act, 1999 provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority. The proposed Geothermal Drilling Project falls within the second schedule of the EMCA Act (Revised 2015) under '*Mining including quarrying and open cast extraction of Geothermal energy exploration and production*' and this is what informed this study report. The proponent has commissioned the Environmental and Social Impact Assessment study in compliance with the Act.

1.4 Proposed Project

The proposed Menengai West Geothermal Drilling Project have a conceptual design similar to those of the Menengai Caldera Project. It may include drilling slim-hole wells and potentially full-size geothermal exploration wells to evaluate the feasibility of commercial geothermal development from the western side of the Menengai Caldera (proposed project area). Well testing activities include down hole, completion and other scientific tests. The exact number of production wells will be determined by the average output of each well. Currently, five (5) exploration wells i.e. 201, 202, 203, 204 and 205 have been sited. The wells will be drilled to economical depths of approximately 3000 m to access geothermal fluids.

Full-sized larger diameter (7-inch+ bottom hole diameter) geothermal exploration wells will be drilled in the proposed wells sites MS 201, MS 202, MS 203, MS 204 and 205

The proposed project description and analysis in the ESIA address the possibility of drilling full-sized larger diameter wells for the exploratory drilling program. The feasibility of drilling full-sized larger diameter wells would depend on access to funds, access to sufficient workspace, and the presence or absence of environmental resources and receptors that may be impacted.

The proposed project would include the following activities and components:

- Civil works and site development at the potential drilling sites
- Drilling up to five full-size large diameter wells.
- Well testing
- Decommissioning (Well abandonment and site reclamation depending on the exploration outcome)

1.5 Objective of the ESIA Study

The objective of the study was to carry out detailed Environmental and Social Impact Assessment (ESIA) Study Report for the proposed Menengai West Geothermal Drilling Project, Nakuru County.

The main objective of the ESIA was to identify significant environmental and social impacts associated with the proposed projects and recommend appropriate mitigation measures for integration in all phases of the projects cycle. The ESIA generated an Environmental and Social Management Plan that describe in detail the mitigation measures to be carried out, costing, scheduling and responsibility of such measures, and a detailed monitoring process and its schedule. The scope of the Consultants work was:

Task 1 Detailed Desktop Review

To undertake desktop study of all existing documentation, and previous ESIA reports related to geothermal wells drilling and power plants. This would include a detailed study of the proposed geothermal wells drilling at the Menengai West Field.

Task 2 Description of the Baseline Environment

Collate and present baseline information on the environmental characteristics of the proposed project site.

Task 3 Legislative and Regulatory Framework

Identify and describe all pertinent regulations and standards (both local and international) governing the environmental quality, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues at the local, national and international levels.

Task 4 Determination of Impacts of Project Facilities and Activities

Analyse and describe all significant changes expected due to the proposed project. These includes environmental, ecological and social impacts, both positive and negative, as a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions highlighted in Task 2.

Task 5 Occupational Health and Safety Concerns

Analyze and describe all occupational health and safety concerns brought about by activities during all the phases of the proposed project. The Consultant will make recommendations on corrective and remedial measures to be implemented under the environmental management plan.

Task 6 Development of Environmental and Social Management Plans

Develop a comprehensive environmental management plan, recommending a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or maximize socio -economic benefits. The document also to provide cost outlays for the proposed mitigation measures as well as their institutional and financial support, time frame and responsibility.

Task 7 Development of Land Acquisition & Compensation Plans (LACP) and Resettlement Action Plan (RAP)

Undertake a socio-economic survey of the communities surrounding the proposed project. This would include:

- A census of the affected persons and identification of vulnerable groups and indigenous populations
- Eligibility criteria and establishment of a cut-off date for LACP
- Evaluating and preparing an inventory of the affected properties
- Evaluating all other socio-economic costs
- Public consultations/awareness creation of the relevant stakeholders, taking into consideration the gender concerns and vulnerable groups
- Identification of alternative sites, to the affected land parcels
- Developing adequate livelihood restoration mechanisms
- Preparing the LACP implementation costs
- Preparation of an implementation schedule
- Developing a monitoring and evaluation methodology
- Considering the relevant legal provisions for land acquisition and resettlement during preparation of an appropriate Land Acquisition & Compensation Plans (LACP) and resettlement action plan
- Developing a conflict resolution mechanism

Task 8 Development of Monitoring Plan

Give a specific description, and technical details, of monitoring measures for both ESMP and RAP, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, and definition of thresholds that will signal the need for corrective actions as well as deliver a monitoring and reporting procedure.

Task 9 Comparison

Undertake a comparison of all the project alternatives including location, technology etc.

Task I0 Study Reports

The output will be an Environmental and Social Impact Assessment report and a Resettlement Action Plan (RAP)/ Land Acquisition & Compensation Plans (LACP) prepared in accordance with the regulatory provisions.

Task 11 ESIA Update Report Presentation and Peer Review

The consultant to present the draft report which may be subject to a peer review. In the event that any rectification is to be made on the report, the consultant will bear any applicable costs.

Task 12 Approval

The Consultant will present the report prepared under Task 10 for approval by the relevant authorities. The Consultant will be responsible for making any modifications that the authorities may demand before approval of the report.

Task 13 Counterpart Staff

For the purpose of capacity, building the consultant will undertake the study together with counterpart staff seconded by the Client i.e. Environmental Scientists and Community Relations Officers.

1.6 Data Collection Approach

The data collection approach implemented during this exercise included utilizing the following tools:

1. Key Informant Interviews
2. Public Consultations (Public meetings i.e Barazas)
3. Focus Group Discussions (FGDs)

Samples of each of the above the tools have been attached in the Appendices section.

2 PROPOSED PROJECT DESCRIPTION

2.1 Overview

This section describes the drilling areas, proposed project components, and activities that would be undertaken during implementation of the proposed project.

2.2 Potential Drilling Areas

2.2.1 Proposed Project Location and Layout

The proposed project will be conducted in Nakuru County, Kenya. The area referred to as "Menengai West Geothermal Prospect" is located west of the Menengai caldera in the Kenya Rift valley. The Menengai geothermal area is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi, Kenya. The proposed project area is located along the Ol'Rongai Hills located on the western side of the Menengai Caldera. The major town centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo.

The proposed Menengai west geothermal project falls on the western side of the Menengai caldera floor. The caldera floor, which is fairly flat, covers an area of about 88 km2 and is partially covered by young rugged lava flows. The Menengai west floor extends around Boita, Menengai Station, Ngata Farm and Kabarak Estate, the topography is made up of flat grounds whose relief is low. The prevalently flat area north of Menengai between Mogotio, Kampi ya Moto, Kisanana and the Bahati Escarpment is enlivened by north trending, double chain of Ol"Rongai volcanic centres by the roughly triangular, flat topped El Bonwala Hill and by arcuate chains of small hills that span from the Ol"Rongai Estate to the Athinai Estate. East of the area is bound by the alignment of the Bahati Escarpment and the Marmanet rift cliffs bind the northeastern part.

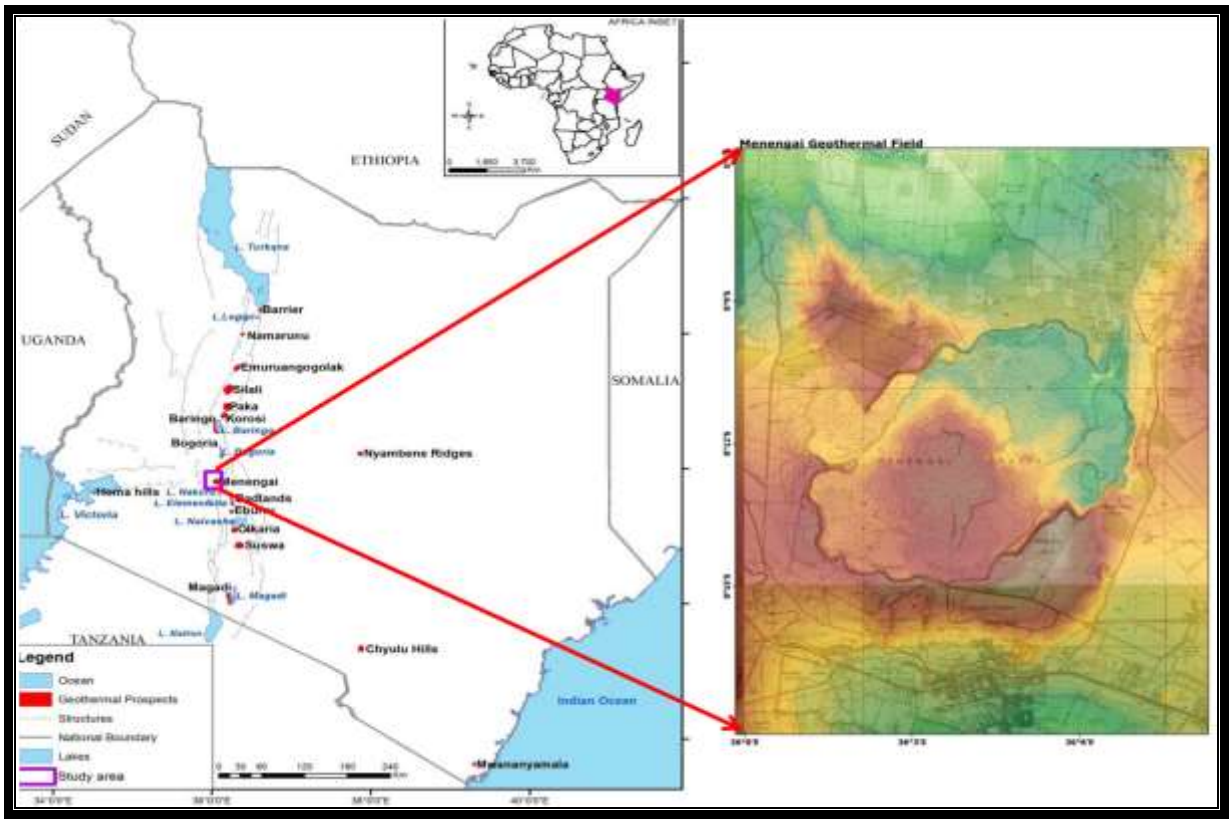

Figure 2-1: Map of Kenya showing the location of the Menengai geothermal exploration site

(Source GRC: Transactions, Vol. 36, 2012)

The following map shows the specific proposed project area.

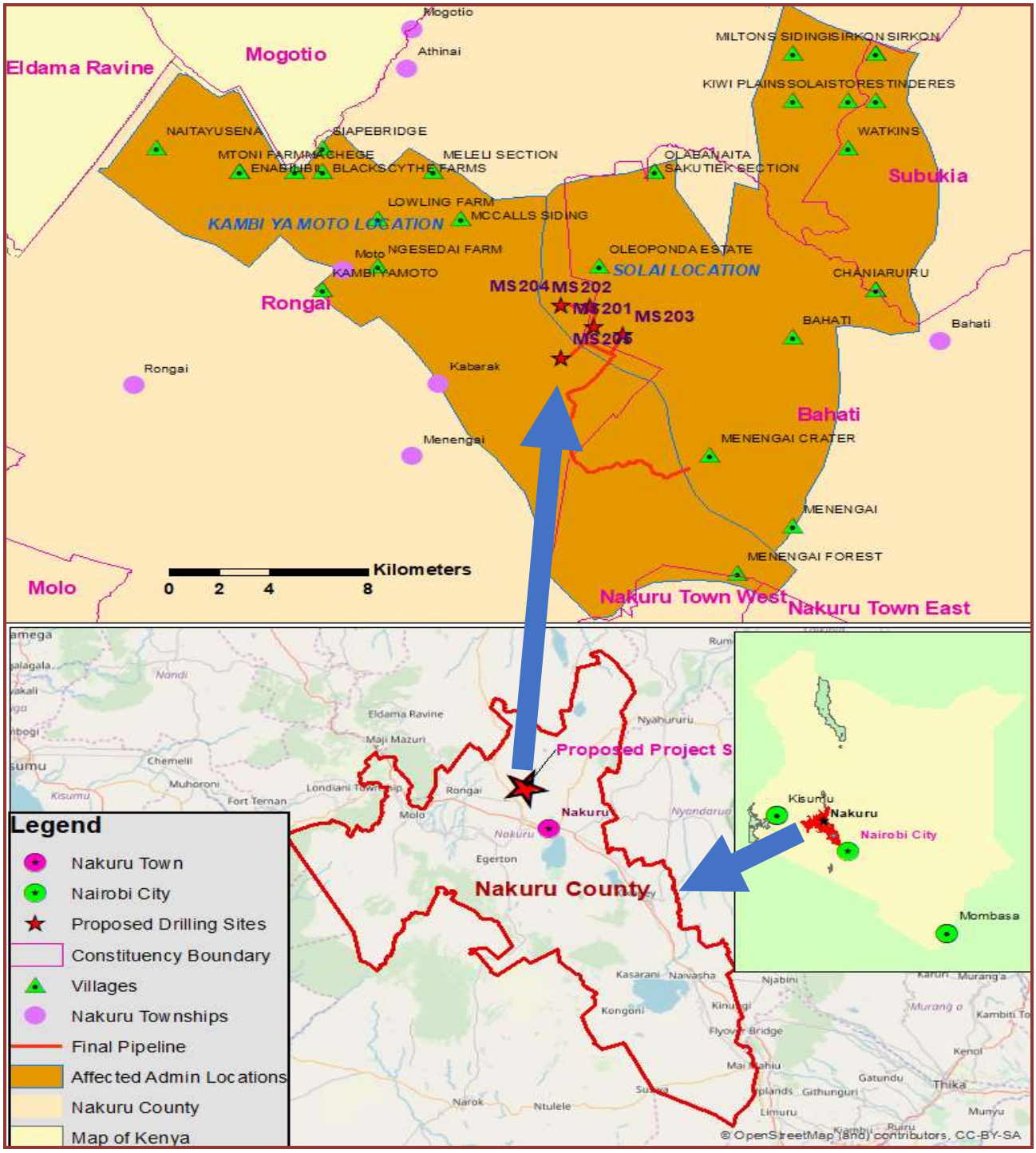

Figure 2-2: Map showing the proposed project location

2.2.2 Proposed Drilling Sites

The proposed project would involve geothermal exploration drilling in the five sites. The potential drilling areas shown on Figure 2-2 below include more land than would be needed during the geothermal exploration program. Larger areas were identified to provide flexibility for selecting suitable drilling sites.

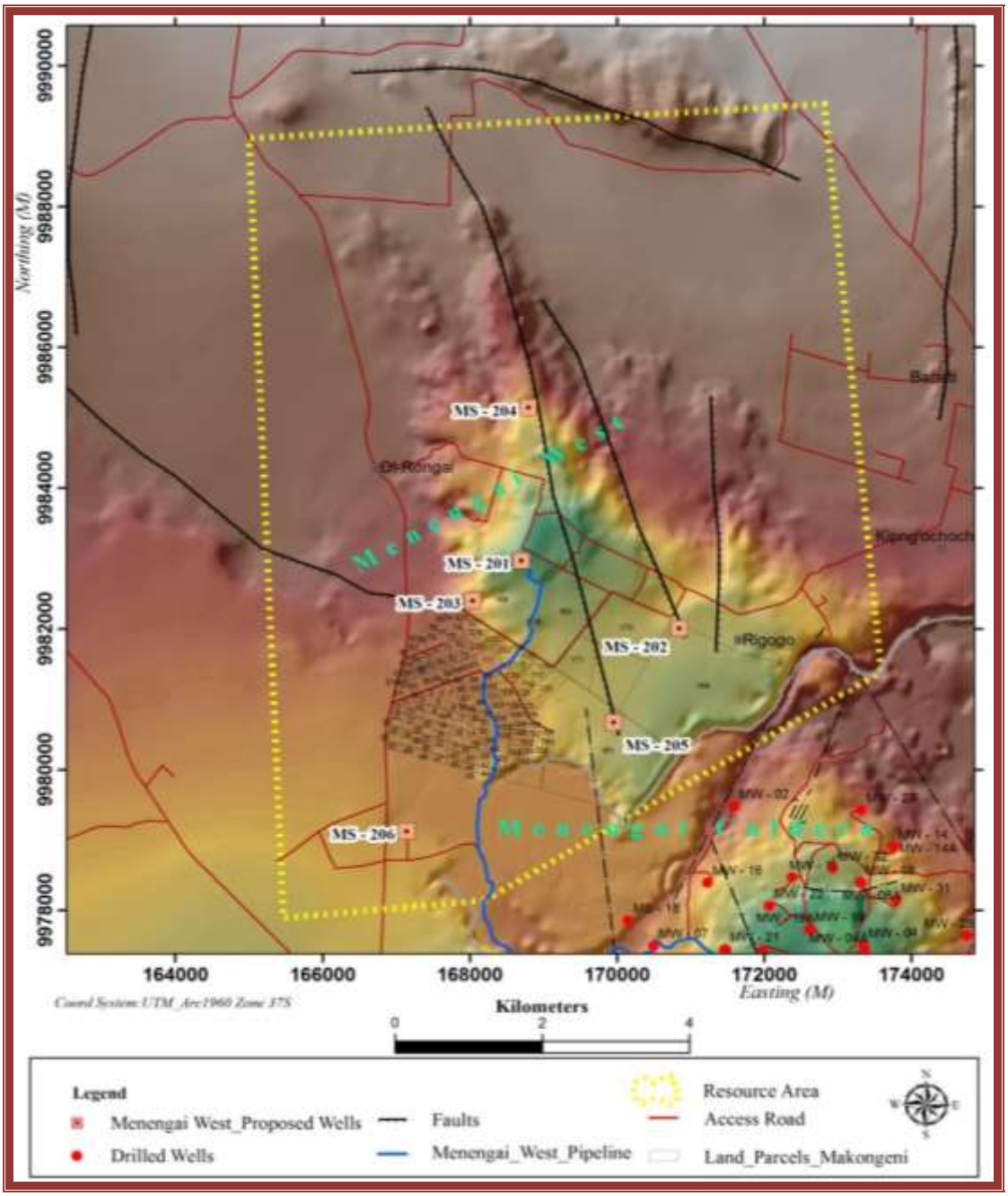

Figure 2-3: Potential drilling area, showing more land than would be needed

Table 2.1 below gives the coordinate locations of the specific five wells using the Coordinate System UTM Arc 1960 Zone 37s.

Table 2-1: Proposed Well Coordinates

SNo.	Name of Proposed Sites	Easting's	Northings	Relative Elevation
1	MS 201	169139	9983845	2042.05
2	MS 202	168984	9984832	1999.81
3	MS 203	170282	9983478	1958.32
4	MS 204	167806	9984870	1925.75
5	MS 205	167828	9982410	1956.34

2.3 Proposed project Description

The geothermal exploration program would include drilling deep geothermal wells. The approach for selecting the specific locations of exploration wells, including their depth and diameter, would depend on a range of factors such as access to funds, land accessibility, environmentally and culturally sensitive areas, identification of feasible well pad locations, and eventual power plant development potential.

2.4 Proposed Project Components

2.4.1 Drilling Process

Geothermal Exploration is normally a process conducted in phases. The drilling mechanism for the initial exploration phase consist of drilling exploratory wells in the resource target areas to evaluate sub-surface conditions and determine if there are indications of presence or absence of a commercially developable geothermal system.

The well drilling results is evaluated before determining the next drilling location and well design. If the exploratory drilling program indicates there may be a commercial resource, appraisal geothermal wells could be drilled in the potential area.

Figure 2-4: Drilling Rig at Menengai, Kenya (source: ARGeo)

2.4.2 Site Development, Civil Works, and Supplies

Table 2-2: Description of key proposed project components during the civil works

Key Project Components	Description
Equipment and Material Sources	Where applicable, equipment and materials will be sourced locally, if available. It is however expected that some equipment and materials would have to be shipped into the country,

	through either Port of Mombasa, or the Jomo Kenyatta International Airport, Nairobi, Kenya. Existing infrastructure at both Ports are adequate accommodate project needs and is the preferred method of obtaining large equipment and materials for the project. The equipment shall reach the site via the road infrastructure. Only sections of the all-weather roads leading to the proposed sites shall require rehabilitation to accommodate smooth transportation of the equipment and materials.
Access Roads	The equipment and materials would be transported from the ports to the exploration target areas using a network of existing paved and unpaved roads, as well as new access roads within the drilling target areas. Existing roads may also be improved by increasing the width at certain sections to accommodate the turning radius for vehicles and drilling equipment, and by reinforcing unpaved roads leading to the drilling target areas. Access roads would be improved or constructed as needed by removing trees and vegetation, grading, installing fill dirt, and/or installing gravel. If necessary, retaining walls along access roads would be installed or replaced consistent with engineering requirements. Fill material and gravel used for access roads would be purchased from local suppliers. The anticipated volume of fill material and gravel is expected to be minor, given that the well pad locations would be chosen at sites close to existing roads. Access roads would be established with a width of approximately 4 to 6 meters (which is already provided in the existing roads and wayleaves). Improvement (and where necessary, construction of new access roads) would occur immediately before well pad development. A drilling rig capable of completing the slim-hole wells is approximately 3 meters (about 10 feet) wide. Existing bridges and culverts would be reinforced or replaced, where necessary. Temporary or permanent drainage crossings would be installed as needed to accommodate equipment access. These crossing could include bridges, culverts, steel plates, and rock. Temporary crossing materials would be removed from drainage crossings following construction.
Equipment and Material Storage	Equipment and material storage sites would be developed near each drill pad or as close as possible if space is limited. The total space needed at each location would be approximately 0.1 to 0.2 hectare (0.25 to 0.5 acre). If necessary, storage sites would be cleared of vegetation and graded prior to use. Gravel and drainage materials may also be installed to facilitate all weather access. Equipment and materials at the storage sites would be transported to and from well pads and other project sites, as needed. If necessary, a security fence and lighting would be installed around the storage sites, and security guards may be stationed at the sites.
Workers Camp	If required, a worker camp would be established in the project areas to house the construction workforce during exploration activities in each area. Typically, the worker camp could house up to 50 workers and could include separate sleeping and bathing facilities for men and women, safe food and drinking water, air conditioning, first aid and medical facility, water storage, generators for electricity, and access to communication networks. If necessary, a security fence and lighting would be installed around the worker camp, and security guards may be stationed at the camp.
Well Pads	Well pads would be developed at each drilling location where the drilling equipment and materials would be positioned. A well pad for a exploratory wells are generally 100 by 100 meters or approximately 0.8 to 1.6 hectares (2 to 4 acres) in size. Well pads generally include the equipment and components listed below; The characteristics of full-sized wells large diameter wells are described further in Section 2.4.3 • Drill rig • Well head

	• Blowout prevention equipment • Power supply engines • Fuel tanks • Accumulator • Pipe racks • Drilling mud tanks • Drilling mud pumps • Water storage tanks • Water supply pipelines • Mixing tanks • Reserve pit • Office space • Storage space • Fire-fighting equipment • Parking space Well pad development would include removing vegetation (including trees). The ground surface would be prepared by grading, compacting soil, and installing a layer of gravel. Gravel used for the well pads would be purchased from local suppliers (which include several quarries within the project area). The typical layouts of a larger diameter full- sized well is shown in Figure 2-4..

Source: (Maurer Engineering Inc. 1998)

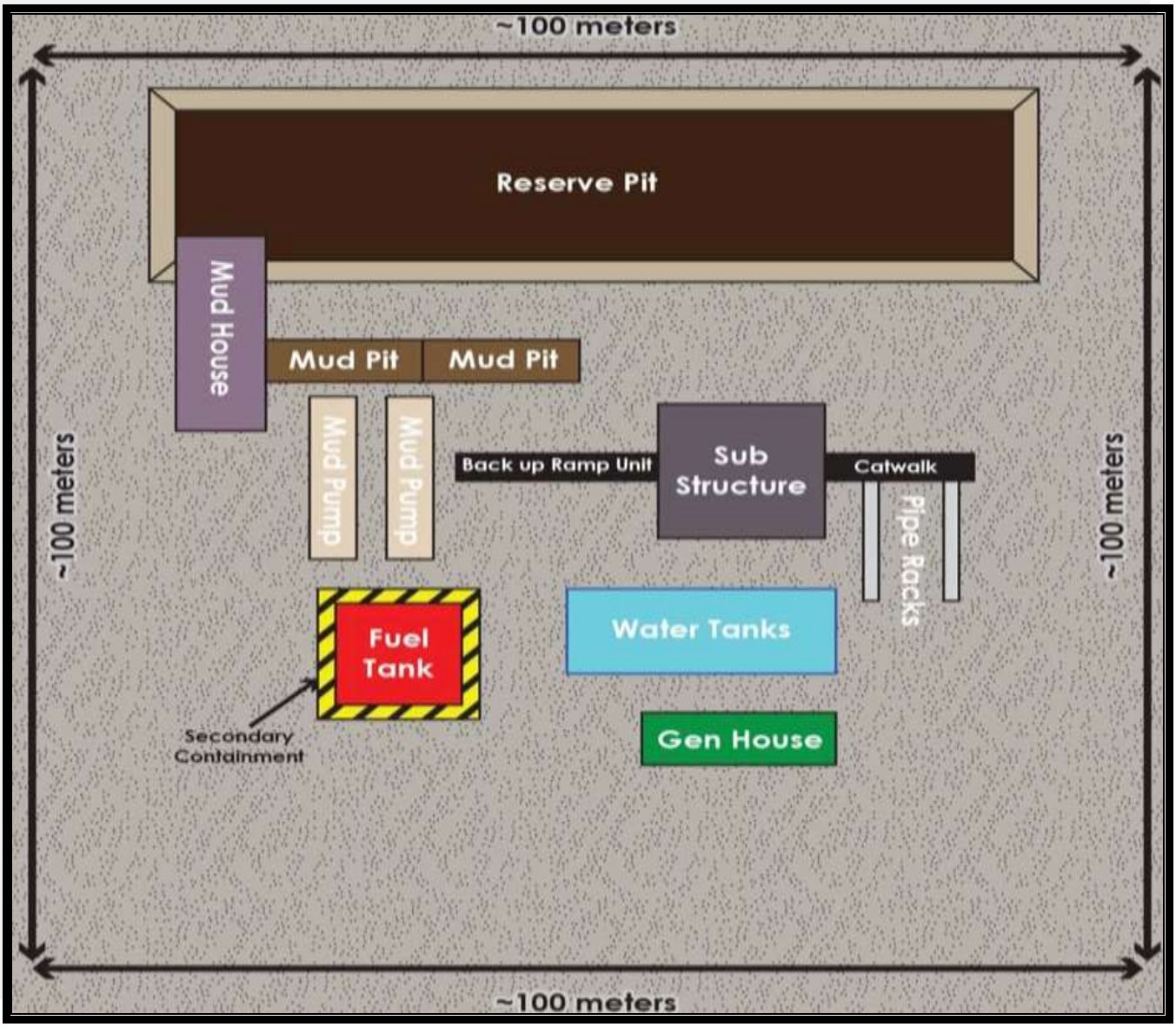

Figure 2-5: Typical Layout of a Full-Sized large diameter Well Pad (NOT TO SCALE)

Source: (Maurer Engineering Inc. 1998)

2.4.3 Well Drilling

As already described in the earlier sections, the proposed project includes drilling exploratory and appraisal larger diameter wells at the potential drilling areas.;, The table below lists some of the key parameters of full-sized large diameter wells.

Table 2-3:* Potential *Drilling Operations for large diameter wells

Component	Full-sized larger diameter Wells
Well Pad Dimensions	100 x 100 meters (0.2 hectare) (330 x 330 feet; 0.5 acre)
Drill Rig Dimensions	20 x 10 meters (66 to 33 feet)
Minimum Access Road Width	6 to 7 meters (18 to 24 feet)
Well Diameter at Depth	7 inches
Target Depth	Varies, but could be estimated at between 2,000 to 3,000 meters (6,600 to 9,850 feet)
Estimated Water Demand during Drilling	Estimated at 20 to 30 liters per second (up to 90 days)

Drilling Materials	• Drilling mud/fluid • Casing • Cement
Drill Cuttings/Waste Storage	Lined sumps
Drilling Period	30 to 90 days (up to 24 hours per day)
Geothermal Resource Testing	Injectivity and production testing
Testing Period	Typically 30 to 90 days (if working up to 24 hours per day)

Sources: (GeothermEx and Power Engineers 2017)

The exploration wells are drilled using a combination of rotary and diamond coring drilling techniques. A diamond-coring rig that is equipped to rotary drill is the ideal rig type to complete these wells.

Drilling requires water to cool the drill and wash drill cuttings from the drill bit1. The final volumes required will be defined after selection of the drilling rig and hydraulics calculations are completed. Wells are drilled using water and non-toxic drilling mud. Variable concentrations of non- toxic additives (drilling fluid) are introduced to the drilling mud as needed to prevent corrosion, increase mud weight, and prevent mud loss. Additional drilling mud are mixed and added to the mud system as needed to maintain the required mud quantities.

All drill cuttings and drilling fluid would be discharged to a reserve pit or tank. After drill cuttings settle, the drilling fluid would be disposed of in a shallow well or open reserve pits. Drill cuttings would be left in the reserve pit if found to be non-toxic after testing. The final sump dimensions would be designed to handle all cuttings and mud that is not re-circulated.

An exploration well may need to be re-drilled or worked-over if problems occur that prevent completion of the well. Potential problems may include mechanical malfunctions, difficulty setting the casing, or limited permeability, productivity, or injectivity. The well may be re- drilled by re-entering and re-drilling the existing well bore, or moving the drill rig to a different location on the well pad and drilling a new well through a new conductor casing. Each well will be equipped with a well head and operating valve.

2.4.4 Geothermal Resource Testing

Testing for the presence or absence of an exploitable geothermal reservoir will be conducted after each well is completed. Depending on the final depth and characteristics of each well, these tests would include downhole temperature measurements, injection testing or production testing. Temperature-gradient measurements will be completed periodically for weeks after completion, after the drilling rig is off the location.

Wells that encounter elevated temperature and permeability at depth may be completed with a slotted liner. If large diameter exploration wells are drilled and successfully encounter the geothermal reservoir, well and reservoir testing would be conducted to analyze characteristics of the resource. One or more initial short-term flow tests would occur at each exploration well, and one or more long- term flow tests will occur after the completion of all wells to assess the productivity of the geothermal reservoir and to sample the geothermal fluid..

[1]*Drilling operations for the deeper sections of each well require relatively small amounts of water flow, whereas the larger hole diameters near surface require significantly more water flow for hole cleaning.*

The well bore would ideally be cleared of all residual drilling mud and drill cuttings prior to conducting a well production test. Air may be injected to facilitate the well to flow. The geothermal fluids would be allowed to flow from the exploration well into an atmospheric separator, where temperature, pressure, flow rate, and chemical composition are monitored. The separated water would be discharged to tanks and steam would be released to the atmosphere through a silencer. The silencer may be a rock muffler or a larger diameter pipe. An injectivity test may also be performed by injecting the extracted geothermal fluid back into the exploration well. A long-term flow test may be performed, if warranted, to measure the flow temperature, pressure, and chemistry over time. The decision to conduct a long-term flow test will depend on wellbore conditions, benefits from the data obtained, and casing integrity.

2.4.5 Well Abandonment and Site Reclamation

The commercial potential of each exploration well would be assessed after testing. The well will not be abandoned if it is determined to have long-term use as a production well, monitoring well, or injection well. Equipment would be removed and the site cleared of excess material. The wellhead will remain in place for future testing, monitoring, or production.

If a well is not determined to have commercial potential, monitoring of the well may continue or the well may be abandoned. Well abandonment typically involves plugging the well bore with enough cement to ensure that fluid in the reservoir would not flow into different aquifers; the casing would remain in place. Any wellhead equipment would be removed from the well, and a metal cap would be welded to the casing.

The well pad sites would then be graded as necessary to restore the sites to the approximate original topography.

2.5 Water Demand and the Water Supply Line

The proposed project would require fresh water for the workforce and to support well pad compaction and well drilling. Potable water would be obtained, hence the project has a proposed key pipelines to deliver the water to all the proposed project sites as shown in figure 2-5.

- Water pipeline routes from the water boreholes to the resource area within the proposed Menengai west geothermal project site shall be demarcated and vegetation cover cleared. However, in so doing, the report has recommended minimal vegetation destruction. The Report has also encouraged maximum use of road reserves (public lands) to minimise resettlement of people.
- Water pipelines shall be delivered to the site and laid from the water boreholes to the resource area within the Menengai west geothermal project site

Figure 2-6 below shows the project layout and the proposed routes for the water pipelines to each of the proposed project site.

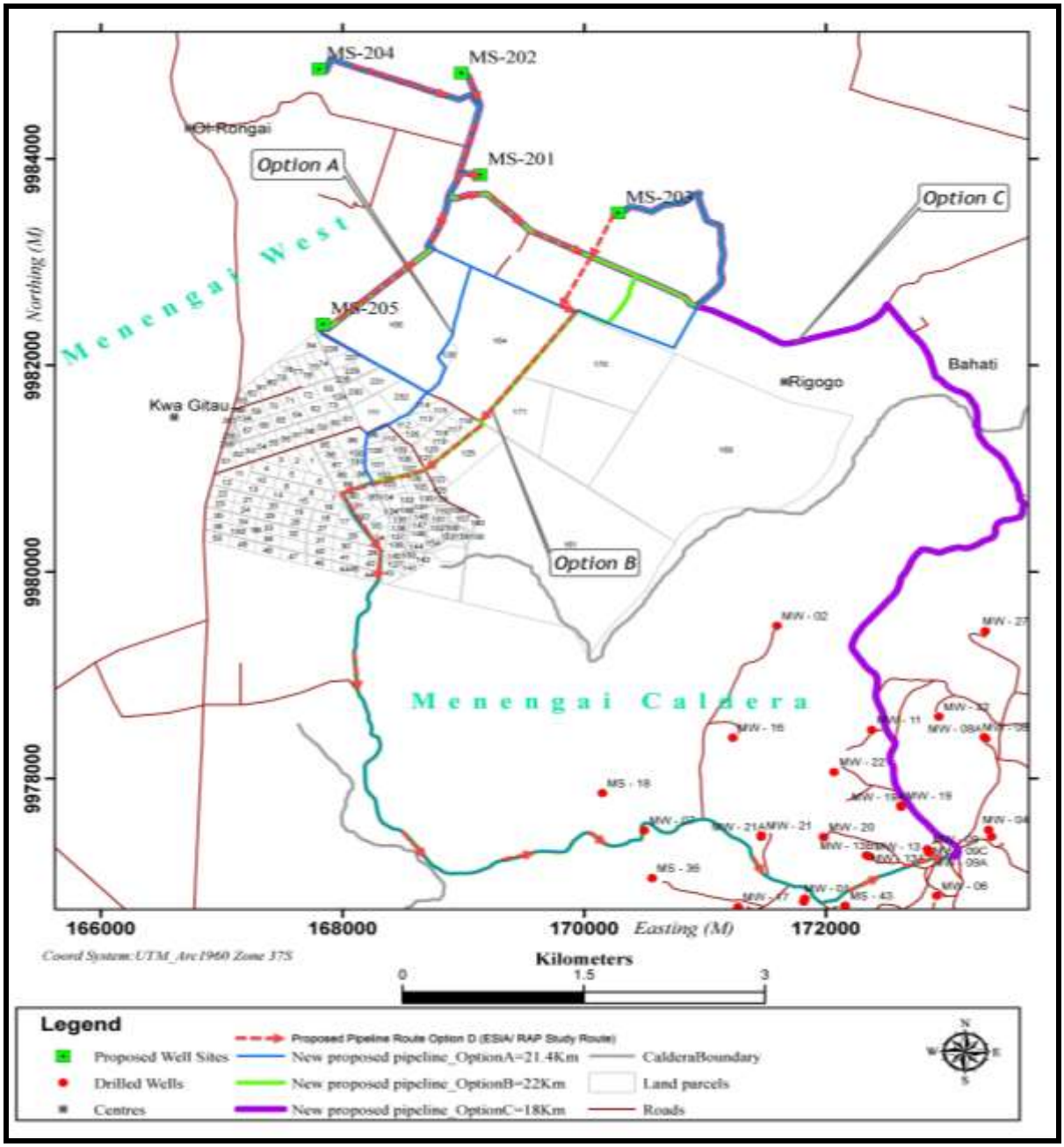

Figure 2-6: Project layout showing the proposed water supply routes to each of the proposed well site

2.6 Land Requirement for the Proposed Project

Based on ***Figure 2-5****: (Potential Drilling Operations of large diameter wells)* and ***Figure 2-6****: Project layout showing the proposed water supply routes to each of the proposed well site*) above, and also based on the discussions and consultations with the GDC field team during fieldwork study, the amount of land that would be required for the proposed well drilling project and the pipeline way-leave has been determined.

For each of the proposed of geothermal exploration site, a total area measuring 140m by 120m (i.e. equivalent to16,800 sq.m, or 4.15 acre-US, or 1.68Ha) was proposed. For the purpose of the study, the proposed well drilling site was taken as central. For the proposed water pipeline that would deliver water to the proposed project sites, 9-metre way-leave (which already exists as roads reserves) was proposed. Most section of the wayleave are available through the public road networks in the area, and

therefore minimal private lands would be affected. All private lands likely to be affected by the proposed project have been discussed in the *Land Acquisition and Compensation Program Report (LACP) Report*, annexed to this Report.

2.7 Erosion and Sediment Management

Best management practices (BMPs) for erosion and sediment control would be developed during the project design. BMPs would be used to stabilize loose soil and control sediment. Typical BMP materials installed on construction sites include fibre matting, hydro-seed, and mulch, straw wattles, silt fencing, rock bags, and hay bales. Typical BMP procedures implemented on construction sites include wetting loose, dry soil during ground disturbance; preventing soil track-out onto paved roadways; and covering truckloads when transporting soil.

2.8 Hazardous Material Management

Hazardous materials, such as fuels, oils, and lubricants for construction equipment, would be stored in the designated storage area. Used oil would be gathered and stored in tanks at the storage area until it could be transported off site and disposed of at a facility that can accept hazardous materials. A roof would be installed over a portion of the storage area to protect construction materials from the rain. Wells would be drilled with water and non-toxic drilling mud. Hazardous materials would be transported, handled, and stored in accordance with applicable Kenyan laws, World Bank General EHS Guidelines Section 1.5 (2007a), and World Bank EHS Guidelines for Geothermal Power Generation Section 1.1 (2007b).

2.9 Waste and Effluent Disposal

All drill cuttings and drilling fluid would be discharged to the reserve pit or tanks. Drill cuttings would be left in the reserve pit. Fluids and solids would be tested to determine the chemical composition and identify any materials that may be hazardous. Any drill cuttings that exceed the toxicity threshold for hazardous waste would be treated as hazardous waste and disposed of off-site.

Latrines for workers would be constructed on the proposed project site and would be maintained in a clean condition. A septic tank system would be installed to manage the wastewater from the worker camp.

Trash would be maintained in covered receptacles at the well pads, storage area, and worker camp. Non-hazardous waste would be disposed of at an authorized dumpsites.

2.10 Land Ownership and Land Use in in Proposed Project Area

2.10.1 Land Ownership

For the greater Menengai area, an estimated 60% of the land is public land; ownership which comprises of the Menengai Forest that covers the Northern, Eastern and Southern parts of the Menengai Caldera (majorly for forest and wildlife). However, towards the proposed project sites, the land is privately owned with average farm sizes of 4.5 hectares.

Land is an important asset for the residents as most of them depend farming as a source of income. The survey findings indicated that all the affected persons have proof of ownership, either title deeds, allotment letters, tenancy agreements or sale agreements. When asked how they acquired the lands,

especially in the project-affected areas, majority of the affected persons (85%) said they bought. Others got the properties through inheritance.

2.10.2 Land use

As the population increased, land use and/or land cover in the Menengai Landscape has been changing rapidly due to the increased interactions of human activities like geothermal energy development. These changes are likely to cause a shift in the generation of goods and services from the biophysical environment, and thus need to be understood.

Substantial land use/land cover changes had taken place with population increase between 1989 and 2000, following increased birth rate and health care access with large population in the part that touches Nakuru municipality (*Lucy Chepkochei and Frashia Njoroge, 2012*). Rapid urbanization, deforestation and energy generation were noted to be the major factors influencing rapid land use/land cover changes in the study area. Economic developments like geothermal exploration and the rising population were noted to be the major factors influencing land use/land cover changes in the Menengai Landscape (GRC Transactions, Vol. 36, 2012).

There has been an increase in agricultural land, indicating that barren land has changed into agricultural land following better farming methods. Forest cover has decreased implying destruction of forests through deforestation and changing climatic conditions that inhibit natural growth of vegetation.

The local population in the northern and northeastern parts of the proposed project area employs the land for small-scale intensive mixed farming, including keeping livestock. The eastern and southern parts of the proposed project area consist of suburban and urban developments. The local population in the western part of the proposed project area and in parts of the Caldera floor engages in large-scale wheat and dairy farming.

3 LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

This section provides the legal, policy and institutional framework context for the ESIA, identifies the Kenyan and International legal requirements, AfDB, World Bank and the French Development Bank's policies and guidance on environmental and social impact assessment. This ESIA has been prepared to fully comply with environmental and social legislation and procedures in Kenya and International Laws and Guidelines on environmental and social safeguard policies.

3.1 Kenya's Legal, Policy and Regulatory Framework

3.1.1 The Legislative Framework

i. The Constitution of Kenya, 2010

The Constitution of Kenya, 2010 provides a detailed framework for dealing with environmental issues. Article 42 of the Constitution states that every person has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures

The Constitution of Kenya is applicable to this proposed project as every person living in the country is entitled to a clean and health environment and the principle of public participation is a bill of right.

i. Geothermal Resource Act, 1982, supplementary legislation of 1990

Several Acts of Parliament regulate and guide use of geothermal and other natural resources in a sustainable manner. The laws that deal specifically with geothermal development are Environmental Management and Co-ordination Act of 1999 (EMCA 1999) and the Geothermal Resource Act of 1982 and its supplementary legislation of 1990. Other regulations do not refer specifically to geothermal development but, due to their implications, affect geothermal development at various stages in various ways. The Act regulates access to and exploitation of geothermal resources for power generation. This regulation is relevant to the proposed project since it deals with geothermal development.

The Act focuses on the drilling and licensing of geothermal wells while taking into consideration the need to dispose the waste products from the geothermal processes appropriately. The regulations stipulate the procedures to be followed by those who wish to explore, drill, extract and utilize geothermal resources. The Act has provisions on authority for geothermal resources and states that all ownership of all geothermal resources under any land is vested with the Government. The minister for energy is responsible for declaring any area a geothermal resources area and grants the authority or license to search for geothermal resources or to drill and extract geothermal resources and to do all that is necessary for the conduct of those operations.

ii. Environmental Management & Coordination Act, 1999 (Amended 17th June,20l5)

The principal national law in this case is the Environmental Management and Coordination Act (EMCA), 1999 (Amended 2015) provides for the establishment of an appropriate legal and institutional framework for the management of the environment. EMCA was established as a framework law and this is because so far this is the only single piece of legislation that contains the most comprehensive system of environmental management in the country.

The relevant regulations under EMCA for this project include:

- **Environmental (Impact Assessment) and Audit Regulations, 2003**: The regulations provide for conducting Environmental Impact Assessment and Environmental Audits. This regulation will be relevant to this project as it follows under the list of projects that must undergo screening for EIA.

- **Environmental Management and Co-ordination (Water Quality) Regulations 2006:** Regulations provide for the protection of lakes, rivers, streams, springs, wells, and other water sources. The regulations also stipulate that all industries should refrain from any actions, which may directly or indirectly cause water pollution. This regulation gives a minimum distance from a water body for which any development may be undertaken and as suaqzswch this project must take this into consideration.

- **Environmental Management and Co-ordination (Waste management) Regulations 2006**: Regulations set out standards for handling, transportation and disposal of various types of wastes. The regulations stipulate the need for facilities to undertake, in order of preference, waste minimization or cleaner production, waste segregation, recycling or composting. These regulations will be followed in providing guidelines on how to store, transport and dispose any wastes generated during the drilling of wells. Some of these wastes generated may fall under the hazardous wastes category and thus require particular disposal arrangements.

- **Environmental Management and Co-ordination (Air Quality) Regulations (2014):** The objective of this regulation is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air quality tolerance limits. The regulations will therefore be relevant to the drilling works (including transportation) and also to operational sites.

- **Environmental Management and Coordination Controlled Substances Regulations, 2007:** The regulation defines controlled substances and provides guidance on how to handle them. This regulation mandates NEMA to monitor the activities of persons handling controlled substances, in consultation with relevant line ministries and departments, to ensure compliance with the set requirements

- **Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009:** Regulations determine that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. These regulations will therefore be relevant for this project since noise vibration is expected to be generated during the drilling works.

- **Environmental Management and Coordination (Conservation of Biodiversity, Access to Genetic Resources and Benefit Sharing) Regulations 2006:** The regulations provide for the protection of endangered species, creation of an inventory, and monitoring of their status, protection of environmentally significant areas, provision of access permits, material transfer agreements and benefit sharing.

- **Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations 2006:** Regulations provide for acceptable emission standards in Kenya. Section 4 of the regulations states that any internal combustion engine for motor vehicles and generators

must comply with the emission standards provided for in the First Schedule of those regulations. The contractors should ensure their equipment are run efficiently and comply with the standards.

- **Electronic Waste Management Regulations**- NEMA, Kenya prepared guidelines for E-waste management and in 2013 further completed the development of draft E-waste regulations, which are yet to come into force. Further, the Environmental Management and Coordination (Waste Management Regulations) regulations 2006, still applies to electronic waste where they can be classified as hazardous waste. Responsibilities of the generator includes ensuring E-waste is segregated from other forms of waste and is taken to licenced refurbishers, collection centers or recyclers. The proposed project may generate E-Wastes and therefore will be expected to take all the wastes to licenced refurbishers or recyclers.

iii. The Energy Act, 2006

The Act establishes an energy regulatory commission, which is the main policy maker and enforcer in the energy sector. This commission among other things is responsible for issuing all the different licenses and permits in the energy sector, review and approval of the electric power tariffs, imposition & collection of penalties & fines for non-compliance in the energy sector, formulation of regulations & enforcement of standards in the Energy Sector and ensuring fair competition in the energy sector. With this Act, all the different aspects of energy e.g. electricity, petroleum and renewable energy are brought under one ambit.

The Act prescribes the manner in which licenses shall be obtained for generating, transmitting and distributing electricity. The license is required if generation is more than 1MWe or the power requires a transmission system from the generation site to the consumption site or the power will be distributed to the public.

The Act in Section 67 establishes a rural electrification authority which is mandated to facilitate access to electricity in rural areas, promote development of renewable energy and levy a fee on all electricity sold for the rural electrification fund.

iv. The Forests Conservation and Management Act, 2016

The Act gives effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes. The Act is important for this project where it may affect the Menengai forest. The relevant authorities will need to be kept informed of the impact on trees nearby this project.

v. The Water Act 2016

The purpose of the 2016 Water Act was to align the water sector with the Constitution's primary objective of devolution. The act recognizes that water related functions are a shared responsibility between the National Government and the County Governments. It also gives priority to use of abstracted water for domestic purposes over irrigation and other uses.

Water Resource Management Rules, 2007

The Water Resources Management (WRM) Rules, 2007 was made as per Section 110 of the Water Act, 2002 (repealed) and were gazetted on 28 September 2007. The provisions and functions of the Authority are stipulated in Part III of the Water Act, 2002.

Part VII Section 97 of the Rules states that the Authority shall, where applicable, require an applicant to show evidence of compliance with the provisions of EMCA. Section 99 states the need for controlling and measuring devises for accurate measurement of the water abstracted. The WRM Rules, 2007, Part VIII Section 104, states that the Authority shall be paid for water abstracted by any person in possession of a valid water permit or supposed to have a valid water permit.

Under water Act 2016, WRM was restructured to WRA. The objective of the new WRA is to protect, conserve, control and regulate use of water resources through the establishment of a national water resource strategy. In addition, the WRA is responsible for:

- Formulation and enforcement of standards, procedures and regulation for the management and use of water resources;
- Policy development;
- Planning and issuing of water abstraction permits; and
- Setting and collecting permits and water use fees.

GDC will require substantial amount of water for its operations and would therefore require to comply with the act.

vi. The Wildlife Conservation and Management Act 2013

This is the principal Act regulating wildlife conservation and management in Kenya. The Act establishes the Kenya Wildlife Service (KWS) as the implementing agency. The Act spells the establishment of the national and county wildlife conservation and compensation committees and the wildlife endowment fund.

The Act provide for the protection, conservation, sustainable use and management of wildlife in Kenya and for connected purpose.

From the ecological assessment, there are no critical endangered, threatened, vulnerable or protected species in the project site/area. However, no workers should hunt/kill few wild animals and birds that may stray into the proposed project site. If threatening animals such leopards, hyenas etc. are noticed, KWS should be notified.

vii. Environment & Land Court Act 2012- plus its role and relevancy

This is an Act of Parliament to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes. The principal objective of this Act is to enable the Court to facilitate the just, expeditious, proportionate and accessible resolution of disputes governed by this Act. Section 13 (2) (b) of the Act outlines that in exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court shall have power to hear and determine disputes relating to environment and land, including disputes:

- Relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources;
- Relating to compulsory acquisition of land;

- Relating to land administration and management;
- Relating to public, private and community land and contracts, chooses in action or other instruments granting any enforceable interests in land; and
- Any other dispute relating to environment and land.

Section 24 (2) also states that the Chief Justice shall make rules to regulate the practice and procedure, in tribunals and subordinate courts, for matters relating to land and environment. Section 30 (1) states that all proceedings relating to the environment or to the use and occupation and title to land pending before any Court or local tribunal of competent jurisdiction shall continue to be heard and determined by the same court until the Environment and Land Court established under this Act comes into operation or as may be directed by the Chief Justice or the Chief Registrar.

Land is a basic factor of production for any development. The above requirements should be adhered to during project implementation. This law is important because Any land or/and environmental cases arising from the project will be handled in accordance with the provisions of this Act.

viii. The Agriculture, Fisheries and Food Authority Act, 2013

The Act provide for the consolidation of the laws on the regulation and promotion of agriculture generally, to provide for the establishment of the Agriculture, Fisheries and Food Authority, to make provision for the respective roles of the national and county governments in agriculture excluding livestock and related matters in furtherance of the relevant provisions of the Fourth Schedule to the Constitution and for connected purposes.

ix. The Kenya Forest Act 2005

The Kenya Forests Act, 2005, allows for the sustainable development of a forest in collaboration with institution. Part II (Administration) of the Act, Sec. 4(f) states that; 'The Kenya Forest Service shall collaborate with individuals and private and public research institutions in identifying research needs and applying research findings.'

When the project is complete, GDC should collaborate with KFS in the restoration of the vegetation in their pre-project state. KFS may also assist the GDC in afforestation campaign as corporate social responsibility CSR).

x. The Occupational Safety and Health Act, Revised 2010 [2007]

The Act provides for safety, health and welfare of workers and all people who are present at workplaces.

- **Subsidiary legislation under OSHA**

Occupational Safety and Health Act No. 15 of 2007, Section 55 specifies requirements for compliance with provisions of Machinery Safety. In construction sites of the proposed magnitude and nature, strict protocols need to be put in place to ensure all plants and equipment conforms to these requirements. These include earth moving equipment, chains, hoists, and lifting equipment including tower cranes. These equipment shall be maintained in accordance with provisions of the subsidiary legislation – The Occupational Safety and Health (Examination of Plant Order).

The proponent (GDC) shall ensure that the contractor provides proof of inspection of all plants to be used for work at her site. Special arrangements shall be made by the contractor, in consultation with the proponent, to provide appropriate warning signs for temporary structures that may violate aviation space during the construction phase. Particular structures may include cement silos and tower cranes.

- **Work Injury Benefits Act (WIBA) 2008**

It is an Act of Parliament to provide for compensation to workmen for injuries suffered during their employment. It outlines the following:

Employer's liability for compensation for death or incapacity resulting from accident;

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

The contractors will need to abide by all the provisions of WIBA in managing hazardous environment and according injured persons their dues in terms of shouldering the medical expenses or compensation of the families should there be loss of life.

xi. The Factories and Other Places of Work Act (Cap 514):

This is the core legislation governing requirements for occupational health and safety at the place of work. The Factories Act identifies up to 43 requirements which include; observing high standards of cleanliness, avoiding overcrowding, constructing and maintaining adequate ventilation, and providing and maintaining suitable natural or artificial lighting, as appropriate. This will be once again of particular relevance to the construction phase and operation of temporary worksites.

- **Factories and other places of work (Fire risk Reduction) Rules 2007?**

Nationally, the Factories and Other Places of Work (Fire risk Reduction) Rules, 2007 provides statutory guidelines for the prevention, control and management of fires within workplaces, of which an airport is a part. Section 5 requires that suitable construction materials shall be used in the construction of workrooms where flammable substances are used, manufactured, or manipulated. Section 6 outlines conditions under which highly flammable substances must be stored, provided that no such store shall be so situated as to endanger the means of escape from a workplace or any part thereof in the event of a fire occurring in the store. Section 7 requires that every store room, cupboard, bin, tank or container used for storing highly flammable substances is clearly and boldly marked "Highly Flammable" in English or Kiswahili or otherwise with an appropriate indication of flammability. Section 8 requires that every occupier shall ensure that the quantity of any highly flammable substance present at any one time in a workplace, shall be as small as is reasonably practical, having regard to the processes or operations being carried on. Section 9 also requires all occupiers to ensure that no means likely to ignite vapour from any highly flammable substances, are present where a dangerous concentration of

vapour from flammable substances may reasonably be expected to be present. Further, Section 10 requires the occupier to continuously monitor the workplace with a view to assessing any possible fire risks and mitigate against them. Section 12 requires the occupier to ensure that all necessary steps are taken to remove flammable gases of vapours in a workplace or render the gasses or vapours non-flammable where the operations or processes involve application of heat. In section 13, the occupier shall ensure that a workplace is kept in a clean state and that any accumulation of dirt and refuse is removed at least once a day, and that every store shall have a marked gangway of the prescribed dimensions. Where mobile equipment for transportation of materials is in store, a marked gangway shall be provided to accommodate the size of the equipment and for the use of persons working therein. Fire escape exits shall be provided by the occupier in accordance with provisions of Section 17 at every workplace of at least 90 centimetres wide, as far away as possible from the ordinary exit, and locate in a manner that the exit will not lead any person to a trap in the workplace in the event of a fire breakout. Section 18 requires every occupier to ensure that any door of any store where flammable substances are stored are constructed in a manner that the door shall be selfclosing, opening outwards or sliding and capable of containing smoke from within the workroom, in the event of a fire. Section 19 specifies that where a workplace is a storeyed building, every occupier shall ensure that a workplace is constructed in such a manner as to enable workers have access to other suitable outlet or exit for the evacuation other than the emergency exits. Section 20 requires occupiers to establish fire-fighting teams that shall be trained as specified in Section 21 and carry out functions outlined in section 22. Section 23 requires the occupier to ensure that fire drills.

All the sections described above are relevant to this project and should be enforced by the proponent and the contractors.

- **Factories and other places of work (Medical Examination) Rules L.N 24/2005**

These rules provide for Occupiers to mandatorily undertake pre-employment, periodic and termination medical evaluations of workers whose occupations are stipulated in the Second Schedule of the OSHA and the First Schedule of the above Regulation. Workers that fall under the above two schedules are required to undergo medical evaluations by a registered medical health practitioner duly registered by the DOSHS. It will be incumbent on the Contractor to ensure that Material Safety Data Sheets (MSDSs) for chemicals used in the construction phase are studied for toxicological and epidemiological information and workers trained on their safe handling, use and disposal. If any of these products present negative impacts to human health, the workers exposed to the chemicals will be required to undergo medical examinations in accordance with the above Rules.

- **Factories and other places of work (Safety and Health Committee) Rules L.N 31/2004**

Competent persons shall be in charge of site safety and appropriate arrangements be made to ensure that safety and health committees are formed as provided for in Section 9 of OSHA and Section 4 of the Factories and Other Places of Work (Safety and Health Committees) Rules. All employees are expected to be trained on their obligations to comply with provisions of the Act through appropriate trainings organized by the contractors. The trainings shall comply with provisions of section 12 of the Factories and Other Places of Work (Safety and Health Committees) Rules of 2004. Appropriate personal protective equipment shall be provided by the contractors to all employees so as to protect them from hazards associated with their work. These should include highly reflective jackets, helmets, dust masks, earmuffs, safety harnesses when working at heights, and protective clothing. The

contractor shall be required to cause to be carried out an external safety and health audit of the workplace at least once in every period of twelve months as provided in Section 11 of OSHA, and Section 13 of the Factories and Other Places of Work (Safety and Health Committees) Rules. Internal audits and inspections should be carried out by the safety and health committee constituted by the contractor as spelt out in Section 6 of the Safety and Health Committees Rules. Section 55 specifies requirements for compliance with provisions of Machinery Safety. In construction sites of the proposed magnitude and nature, strict protocols need to be put in place to ensure all plants and equipment conforms to these requirements. These include earth moving equipment, chains, hoists, and lifting equipment including tower cranes. These equipment shall be maintained in accordance with provisions of the subsidiary legislation – The Occupational Safety and Health (Examination of Plant Order). The proponent shall ensure that the contractor provides proof of inspection of all plants to be used for work at her site. Special arrangements shall be made by the contractor, in consultation with the proponent, to provide appropriate warning signs for temporary structures that may violate aviation space during the construction phase. Particular structures may include cement silos and tower cranes. Special care shall be taken by the contractor to ensure transport safety including maintenance of fleet and control of speeds so as not to foul the air with dust. Excessive dust may have dire consequences to aviation space and therefore must be checked through regular water sprinkling of routes used by trucks, or by application of appropriate hydroscopic materials on earth roads. In addition, the contractor must carefully select routes to be followed during movement of construction materials. All drivers must have the requisite training and competence to operate stationary and mobile equipment, and appropriate procedures developed by the contractor must be observed at all times. These may include loading and unloading procedures. The contractor must ensure that pollution from trucks is controlled by limiting the loads carried and that maintenance is carried out as scheduled.

- **L.N. 25: Noise Prevention and Control Rules, 2005**

These rules were promulgated on 10 March 2005 for occupational noise exposure and apply to workplaces in Kenya. The regulation is applicable to the project as noise potentially generated by construction equipment may exceed the permissible occupational noise levels given below. The rules set the permissible level for occupational noise in any workplace (which includes construction sites) as follows:

- 90 dB(A) over an 8-hour TWA period over 24-hours; and
- 140 dB(A) peak sound level at any given time.

Additionally, the rules set permissible limits for community noise levels emanating from a workplace as follows:

- 50 dB(A) during the day; and
- 45 dB(A) at night.

If noise levels exceed the above permissible levels, the Occupier is required to develop, rollout and implement a written hearing conservation program which should include the following sections as a minimum:

- Undertaking a Noise Level Survey;
- Education and training of persons affected by excessive noise;
- Engineering noise control methods;
- Hearing protection requirements;
- Posting of notices in noisy areas;

- Audiometric testing methods and frequencies for those exposed to high noises; and
- Annual program review.

The Proponent is to ensure that any equipment brought to a site in Kenya for use shall be designed or have built-in noise reduction devices.

xii. Public Health Act, 2012

This Act of Parliament makes provision for securing and maintaining health. Section 115 of this Act prohibits causing nuisance or other condition liable to be injurious or dangerous to health. Section 118 provides a list of nuisances, which includes any noxious matter or waste water, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any watercourse, irrigation channel or bed thereof not approved for the reception of such discharge.

The Public Health (Drainage and Latrine)

Rules Rule 85 provides that every owner or occupier of every workshop, workplace or other premises where persons are employed shall provide proper and sufficient latrines for use by employees.

Rule 87 requires every contractor, builder or other person employing workmen for the demolition, construction, reconstruction or alteration of any building or other work in any way connected with building to provide in an approved position sufficient and convenient temporary latrine for use by such workmen.

Rule 91 provides that no person shall construct a latrine in connection with a building other than a water closet or a urinal, where any part of the site of such building is within 200 feet of a sewer belonging to the local authority, which is at a suitable level, and where there is sufficient water supply.

Relevance: This Act is applicable to the project since the contractors will be required to provide toilets for use by workers and visitors to the site during construction phase of the proposed project.

xiii. County Government Act 2012

The Act empowers county governments to control or prohibit all businesses, factories and workshops that, because of smoke, fumes, chemical gases, dust, smell, noise, vibration, or other cause may be a source of danger, discomfort or annoyance to the neighbourhood and to prescribe the conditions subject to which business, factories and workshops shall be carried on

xiv. The Employment Act, 2007

The Act is enacted 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 and federations

xv. The Traffic Act, 2016

This Act specifies that motor vehicles use proper fuel. The Traffic regulations promulgated under the Act specifies that every vehicle is required to be so constructed, maintained and used so as not to emit any smoke or visible vapour. This Act will apply to the project during the construction and operation phases

xvi. The Valuers Act, 1985

The Act provide for the registration of valuers and for connected purposes. The Act established the Valuers Registration Board, which have the responsibility of regulating the activities and conduct of registered valuers. This mainly applies to the people whose properties were affected by the project. This has been addressed in the LACP Report.

xvii. The Work Injury Benefits Act (2007)

The Act provides for compensation to employees for work related injuries and diseases contracted in the course of employment. This act should be revisited in unfortunate event of injuries in the course of the project.

xviii. The Radiation Protection Act, 2012

An Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes. The contractors shall ensure that no workers or community is exposed to dangerous radiations.

xix. The HIV and AIDS Prevention and Control Act, 2014

This Act prohibits discrimination in all its forms and subtleties against persons with or persons perceived or suspected of having HIV and AIDS. Without prejudice to the generality of subsection (1), no person shall compel another to undergo an HIV test as a precondition to, or for continued enjoyment of employment. All employees during this project will therefore be treated fairly and in accordance to the provisions of this Act.

xx. The National Gender and Equality Commission Act, 2011

The National Gender and Equality Commission Act, 2011 established the National Gender and Equality Commission (NGEC). The functions of the commission are stipulated in Section 8 of the Act, which include, inter alia, promoting gender equality and freedom from discrimination.

In the spirit of this law, the contractors should consider fairness in opportunities distributions to the youth, women, persons with disabilities and elderly where applicable.

xxi. National Museums and heritage Act 2006

This Act provides for control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya. Under Section 30. Where a person discovers a monument or object of archaeological or paleontological interest, the person shall, within seven days, give notice thereof, indicating the precise site and circumstances of the discovery, to the National Museums, and in the case of an object, shall deliver the object to the National Museums or to the District Commissioner to keep it for any purpose or for any purpose or for any period. Under Section 31 Subjects to section 27, no person shall move a monument or object of archaeological or paleontological interest from the place where it has been discovered otherwise than in such manner and to such place as may be allowed by an exploration license, or by written permit from the Minister after consultation with the National Museums. The Act by notice in the Gazette, prohibit or restrict access thereto or any development thereof, or the use thereof for agriculture or livestock, or activity thereon of protected areas.

Where the Contractors encounters or discovers a monument or object of archaeological or paleontological interest during construction, he (or GDC) will be required to comply with this Act by reporting such findings to the museums of Kenya.

xxii. National Construction Authority Act 2011

The NCA published the National Construction Authority Regulations 2014, the Code of Conduct and Ethics for the Construction Industry, and the NCA Strategic Plan (2015-2020) to effectively regulate the construction industry in Kenya. Contractors operating or willing to undertake construction operations in Kenya are required by law to register through the National Construction Authority (NCA), which is constituted under Act No. 41 of 2011 Laws of Kenya. The NCA is mandated to clear builders and contractors as a way of eliminating rogue contractors in Kenya and malpractices in the building and construction industry. The Authority has provided the regulatory framework for registration and renewal of contractors. It is tasked with the responsibility of inspecting construction and building projects around the country to ensure high quality of work and close projects posing health risks and collapse hazards.

The proponent should contract an NCA registered contractor and adhere to the regulations as it is stipulated.

xxiii. Mining Act 2016

AN act of Parliament to give effect to Articles 60, 62 (1)(f), 66 (2), 69 and 71 of the Constitution in so far as they apply to minerals; provide for prospecting, mining, processing, refining, treatment, transport and any dealings in minerals and for related purposes.

Section 20 (Functions of the Director of Mines) part 1(l) observes that, the Director of Mines shall, through the Principal Secretary, be responsible to the Cabinet Secretary for exercising regulatory administration and supervision over the use of commercial explosives in accordance with the Explosives Act (Cap. 115). The proponent will, before any blasting or explosive is used, apply for a blasting License from the Director of Mines.

Even though this is a drilling project that may not directly involve use of explosives, civil works process may require construction materials that may require blasting. Sections of the proposed project sites access roads also passes rocky terrain that in extreme circumstances may require blasting.

xxiv. Climate Change Act 2016

The Climate Change Act 2016, passed is May 2016, although the regulations operationalizing the Act are yet to be developed. The Act requires that the public is involved in the development and review of the Climate Change Action Plan. As a requirement of the Act and more importantly the Constitution, the public engagement in the development of policy, strategies and laws is mandatory. It is therefore the responsibility of the players in climate change to ensure that there is participatory communication when there are issues of interest under climate change being discussed.

The Act has also provided for incentives that are geared towards encouraging innovations that are centered on climate change mitigation.

3.1.2 Policy Framework

The Policy Framework relevant for this project includes:

i. Kenya Vision 2030

Kenya aims to be an industrialized country by the year 2030. The Vision 2030 describes three pillars that are crucial for industrialization, they include Economic, Social and Political pillar. Proposed development projects under Vision 2030 will increase demand on Kenya's energy supply.

ii. National Environment Policy, 2013

The National Environmental Policy, 2013 sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources, and recognizes that natural systems are under intense pressure from human activities particularly for critical ecosystems including forests, grasslands and arid and semi-arid lands

iii. The National Bio-Diversity Strategy, 2000

The overall objective of the National Bio-diversity Strategy and Action Plan (NBSAP) is to address the national and international undertakings with elaborated upon in Article 6 of the Convention on Biological Diversity (CBD). It is a national framework of action to ensure that the present rate of biodiversity loss is reversed, and the present levels of biological resources are maintained at sustainable levels for posterity

iv. National Environmental Action Plan (NEAP), 1994 (Revised 2007)

The National Environmental Action Plan provides the framework for implementation of the Environment Policy and realisation of Development Goals and Vision 2030. The integration process involves a multi-sectoral approach in developing a comprehensive framework for environmental management and conservation of natural resources.

i. Ministry of Ministry of Energy and Petroleum

The Act has provisions on authority for geothermal resources and states that all ownership of all geothermal resources under any land is vested with the Government. The minister for energy (and petroleum) is responsible for declaring any area a geothermal resources area and grants the authority or license to search for geothermal resources or to drill and extract geothermal resources and to do all that is necessary for the conduct of those operations.

ii. GDC HSE Policy

GDC recognizes that a successful business relies on the development of a healthy workforce, which is vital to a nation's economic and social growth. Geothermal Development Company (GDC), through their HSE Policy is committed to implementing and maintaining a sound Health, Safety and Environment (HSE) Management System to ensure that HSE concerns are managed in a comprehensive and effective manner. The HSE Management System was prepared with the specific aim of complying with Occupational Safety and Health Act (OSHA), 2007, Environmental Management & Coordination Act; Energy Regulatory Board's Environment, its internal SHE Policy and donor requirements.

3.1.3 Institutional and Administrative Framework

i. The Geothermal Development Company

The Geothermal Development Company is mandated with development of 5000MW of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospect across the Kenyan Rift.

GDC will be responsible for hiring the civil works and drilling contractors to carry out the exploration work. The company will monitor compliance of the contractors with the ESMP, through reports, feedback from the other stakeholders, including NEMA and the communities, as well as through its internal field studies.

ii. The National Environment Management Authority (NEMA)

The responsibility of the National Environment Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be principle instrument of government in the implementation of policies relating to the environment. In addition to NEMA, EMCA, CAP 387, Laws of Kenya provides for the establishment and enforcement of environmental quality standards to be set by the technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

The Authority has registered environmental assessment experts who conduct environmental assessment of proposed projects on its behalf to assess potential negative and positive impacts and develop mitigation measures. Therefore, it shall be the responsibility of the Authority to ensure that an ESIA for the proposed project is conducted and that a license is issued before the project can commence.

The Authority shall ensure that under the ESIA report, the ESIA experts give feedback on public consultation of affected stakeholders in the form of questionnaires to take into account their views in the decision-making.

iii. The National Environment Tribunal

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. If disputes to this project arise, they are supposed to be presented here for hearing and legal direction.

iv. The County Government

The County Government of Nakuru has powers to control or prohibit all businesses, factories and other activities including the proposed project which by reason of smoke, fumes, gases, dust, noise or other cause, maybe or become a source of danger, discomfort or annoyance to the neighbourhood and to prescribe conditions subject to which such businesses, factories etc. shall be carried.

The Constitution of Kenya, 2010 grants county governments the powers to grant or renew businesses licenses or refuse the same. The county government is empowered to make by laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and well-being of the inhabitants of the area. This includes construction and maintenance of water supply, sewage and solid waste management systems.

The proponent shall ensure that they comply with the County Government laws, by ensuring that permits such as for road cutting, water supply, waste management and health and safety is managed properly.

v. The Directorate of Occupational Safety and Health Services (DOSHS)

The construction site is a workplace and the health, safety and welfare of all persons must be taken into account. All workers within the construction site shall be required to use appropriate PPEs.

vi. The National Construction Authority (NCA)

The NCA is responsible for issuing permits to construction sites and advising the government of Kenya on construction. The proposed project shall acquire a permit from NCA and ensure that the contractor is registered by the NCA board.

vii. The Water Act, 2016

The Water Act 2016 provides the legal framework for the management, conservation, use and control of water resources and for the acquisition and regulation of right to use water in Kenya. It also provides for the regulation and management of water supply and sewerage services. In general, the Act gives provisions regarding ownership of water, institutional framework, national water resources, management strategy, and requirement for permits, state schemes and community projects. Part IV of the Act addresses the issues of water supply and sewerage.

Part II section 18 of the Act provides for national monitoring and information systems on water resources. Sub-section 3 allows the Water Resources (WRA) Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may need to be kept by a site operator and the information thereof furnished to the authority.

3.2 World Bank Policy

3.2.1 Bank Environmental and Social Frameworks (ESF)

Applicants seeking financing from the World Bank are required to comply with the applicable bank environmental and social standards.

The World Bank developed an Environmental and Social Framework document that includes ten Environmental and Social Standards (ESSs). The ESSs support the World Bank's OPs and associated environmental and social safeguards, and identify the requirements for borrowers regarding the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing (World Bank 2017.). The Environmental and Social Framework are applicable for all bank supported investments from 1 October 2018. This ESIA complies with the relevant requirements set forth in the Environmental and Social Framework and ESSs.

Summary of the key objectives of relevant ESSs are provided below:

- **ESS1: Assessment and Management of Environmental and Social Risks and Impacts.** ESS1 applies to all projects for which Bank Investment Project Financing is sought. ESS1 establishes the importance of: (a) the Borrower's existing environmental and social framework in addressing the risks and impacts of the project; (b) an integrated environmental and social assessment to identify the risks and impacts of a project; (c) effective community engagement

through disclosure of project-related information, consultation and effective feedback; and (d) management of environmental and social risks and impacts by the Borrower throughout the project life cycle. The Bank requires that all environmental and social risks and impacts of the project be addressed as part of the environmental and social assessment conducted in accordance with ESS1. ESS1 applies to the proposed project and will have to be complied to throughout the project life cycle.

- **ESS2: Labor and Working Conditions.** ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. This ESIA report recognises the importance of compliance with labour laws and international worker's rights at all stages during project development, operation and decommissioning.

- **ESS3: Resource Efficiency and Pollution Prevention and Management.** ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle. Efficient energy use through adoption of energy-saving systems and the avoidance of pollution as much as is practically possible will be key during the implementation of the proposed project in compliance with ESS3.

- **ESS4: Community Health and Safety.** ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable. ESS4 applies to the proposed project.

- **ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.** Involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented. The LACP, which forms part of this ESIA, has been developed in compliance to ESS5.

- **ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.** ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources, and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, who access to, or use of, biodiversity of living natural resources may be affected by a project. This standard applies to the Menengai West Geothermal Development Project.

- **ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities**, Ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. The project area under the Olkaria West Geothermal Project has no indigenous people nor does it have underserved traditional local communities and therefore ESS7 does not apply to the proposed project.

- **ESS8: Cultural Heritage.** ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present, and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle. The scope to which the proposed project may affect cultural heritage has been described under section 7.2.6.

- **ESS9: Financial Intermediaries (FIs)**. ESS9 recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI. The complexity of the proposed project means that there may be FIs at some point within the project life. When this occurs, such FIs will be required to comply with SS9.

- **ESS10: Stakeholder Engagement and Information Disclosure.** ESS10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. A Stakeholder Engagement Plan (SEP) has been prepared as part of this ESIA and in compliance with ESS10.

3.2.2 International Finance Corporation's (IFC) *Environmental and Social Performance Standards*

The International Finance Corporation's (IFC) Environmental and Social Performance Standards define IFC clients' responsibilities for managing their environmental and social risks. The 2012 edition of IFC's Sustainability Framework includes Performance Standards (PSs).

The PSs that may be relevant to the project are described below.

- **IFC PS1 – Social and Environmental Assessment and Management System.** PS1 requires that an Environmental and Social Management System (ESMS) be implemented throughout the life of the project. An effective ESMS identifies and evaluates environmental and social risks and impacts of the project, and defines a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.

- **IFC PS2 – Labor and Working Conditions.** PS2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. PS2 is in part guided by international conventions and instruments, including the International Labour Organization and the United Nations. It recognizes that the client adopt and implement human resources policies and procedures.

- **IFC PS3 – Pollution Prevention and Abatement.** PS3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices.

- **IFC PS4 – Community Health, Safety and Security.** PS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. This Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project-related activities, with particular attention to vulnerable groups.

- **IFC PS5 – Land Acquisition and Involuntary Resettlement.** PS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. It requires that the client consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, and when it cannot be avoided, the client will offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods.

- **IFC PS6 – Biodiversity Conservation and Sustainable Natural Resources Management.** PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented.

- **IFC PS8 – Cultural Heritage.** PS8 recognizes the importance of cultural heritage for current and future generations. In addition to complying with applicable law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage, the client will identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented.

3.2.3 Environmental, Health, and Safety Guidelines

i. General Guidelines

The World Bank's General Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of the environmental assessment. The General EHS Guidelines cover the following topics: Environmental, Occupational Health and Safety, Community Health and Safety, and Construction and Decommissioning.

ii. Geothermal Power Generation Guidelines

The World Bank's *Environmental, Health, and Safety Guidelines for Geothermal Power Generation* provides specific recommendations for management of EHS issues associate with geothermal power generation (IFC and World Bank Group 2007b) The guidelines were designed to be used in tandem with *Environmental, Health, and Safety General Guidelines*, which provides guidance on common EHS issues for all industry sectors. Although this project does not include power generation, the guidelines provide recommendations for management of drillings fluids and cuttings, air emissions (i.e., H2S), solid waste, well blowouts and pipeline failures, and water consumption and extraction. The guidelines also specify worker protection requirements for confined spaces, heat, noise, and infrastructure safety.

3.3 International Policies for International Institutions

The Bank's Policies and Procedures relevant to that maybe relevant to this project include:

3.3.1 African Development Bank Environmental and Social Assessment Procedure Revised 2015 [approved 2001].

The Bank has Integrated Environmental and Social Impact Assessment Guidelines and Environmental and Social Assessment Procedures (ESAP). It details the specific procedures that the Bank and its borrowers or clients should follow to ensure that Bank operations meet the requirements of the operational safeguards (OSs) at each stage of the Bank's project cycle. The guidelines integrate environmental and social concerns into the life cycle of a project and also stipulate requirements for specific projects. Built upon the previous safeguard policies on the Involuntary Resettlement Policy (1995), the Policy on Indigenous Peoples (1998) and the Environment Policy (2002), the Safeguard Policy Statement was approved in 2009. The safeguard policies are operational policies that seek to avoid, minimize or mitigate adverse environmental and social impacts including protecting the rights of those likely to be affected or marginalized by the developmental process. ADB's safeguard policy framework consists of three operational policies on the environment, indigenous peoples and involuntary resettlement.

1. Environmental Safeguard

This safeguard is meant to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision making process.

2. **Involuntary Resettlement Safeguard**

This safeguard has been placed in order to avoid involuntary resettlement whenever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre- project levels; and to improve the standards of living of the displaced poor and other vulnerable groups.

3. **Indigenous Peoples Safeguard**

This safeguard looks at designing and implementing projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems and cultural uniqueness as defined by the Indigenous Peoples themselves so that they receive culturally appropriate social and economic benefits; do not suffer adverse impacts as a result of projects; and participate actively in projects that affect them. Under the ESAP, the Borrower is responsible for integrating environmental and social considerations sponsored projects according to the Bank's requirements.

3.4 International Laws and Guidelines/ /Multilateral Environmental Agreements

In addition, Kenya is also a signatory to a number of international treaties and conventions hence bound to international guidelines that govern the development of geothermal resources. Those that are relevant to the proposed Menengai West geothermal drilling project include:

The International Guidelines relevant to the project that have include:

3.4.1 IFC Environmental, Health, and Safety Guidelines for Geothermal Power Generation

These guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues. 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.

Applicable provisions of the IFC's General Environmental, Health and Safety Guidelines, including the following:

1. Environment

- Section 1.1 Air Emissions and Ambient Air Quality
- Section 1.3 Wastewater and Ambient Water Quality
- Section 1.6 Waste Management
- Section 1.7 Noise

2. Occupational Health and Safety

- Section 2.1 General Facility Design and Operation
- Section 2.2 Communication and Training
- Section 2.3 Physical Hazards
- Section 2.4 Chemical Hazards
- Section 2.7 Personal Protective Equipment
- Section 2.9 Monitoring

3. Community Health and Safety

- Section 3.1 Water Quality and Availability
- Section 3.2 Structural Safety of Project Infrastructure
- Section 3.4 Traffic Safety
- Section 3.7 Emergency Preparedness and Response

4. Construction and Decommissioning

- Section 4.1 Environment
- Section 4.2 Occupational Health and Safety
- Section 4.3 Community Health and Safety

3.4.2 IFC-IGA Geothermal Exploration Best practices

The practices cover the preliminary survey, as well as the geological, geophysical, and geochemical surveys and provide guidance on the survey tools to use for different types of geothermal systems. By following such best practices, developers can reduce early stage project risk by more accurately locating and characterizing geothermal resources prior to drilling.

3.4.3 IFC's Environmental, Health and Safety Guidelines for Hazardous Materials

These guidelines are designed to be used together with the relevant Sector EHS Guidelines for hazardous material. 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.

3.4.4 Ramsar Convention on Wetlands

This is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet. Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements, but it works very closely with the other MEAs and is a full partner among the "biodiversity-related cluster" of treaties and agreements.

The study did not encounter any wetland within the project area. However, the ESMP would mitigate indirect effect to the wetland by managing emission and controlling runoffs.

3.4.5 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. The objective of the 1992 UNFCCC is to tackle the negative effects of climate change.

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.

The Conventions' stated aim is to stabilize greenhouse gas concentrations at a level that allows ecosystems to adapt naturally to climate change so that food production is not threatened, while

enabling economic development to proceed in a sustainable manner (article 2). Kenya signed the UNFCCC on 12 July 1992, ratified it on 30 August 1994 and started enforcing it on 28th November 1994.

Geothermal energy is considered green energy and will contribute to less greenhouse gases. In addition, GDC and the contractors will be required to observe the above convention in all its operations throughout the project cycle in reducing emission of Greenhouse Gasses leading to climate change.

3.4.6 Convention on Biological Diversity

In response to the growing threat posed by human activity to biodiversity and inspired by the world community's growing commitment to sustainable development, during the 1992 Earth Summit in Rio de Janeiro world leaders adopted the Convention on Biological Diversity (CBD). It is the most important Convention dealing with biodiversity conservation.

The Convention has three main objectives:

- To conserve biological diversity
- To use biological diversity in a sustainable way
- To share the benefits of biological diversity fairly and equitably.

IUCN has been involved in the CBD since its drafting and through its further development. Its policy work has helped to ensure that decisions taken by the Parties to the Convention are as effective as possible to achieve the CBD objectives.

3.4.7 Paris Agreement on Climate Change of 12th December 2016

On 12 December 2015, 196 Parties to the UN Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement, a new legally-binding framework for an internationally coordinated effort to tackle climate change. The Agreement represents the culmination of six years of international climate change negotiations under the auspices of the UNFCCC, and was reached under intense international pressure to avoid a repeat failure of the Copenhagen conference in 2009.

The Paris Agreement recognizes the different starting points and responsibilities of countries.

The Paris Agreement builds on the Climate Change Convention and – for the first time – unites all nations in an ambitious effort to combat climate change and adapt to its effects, with enhanced support for developing countries to do so. As such, it charts a new course in the global climate effort.

As already mentioned, Kenya's escalated investment geothermal energy is considered big step towards increased use of green energy, which will contribute to less greenhouse gases. GDC and the contractors will be required to observe these conventions in all its operations throughout the project cycle.

3.4.8 Convention on conservation of Migratory species of Wild Animals (Lake Nakuru and Rift Valley)

This convention was signed in Bonn in June 1979, and entered into force on November 1, 1983. It covers the protection of migratory species and their habitats and is the only global convention established exclusively for the conservation and management of migratory species. It is also concerned with wild animals that migrate across or outside national jurisdictional boundary.

The project area is situated close to Nakuru Park, and Soysambu Conservancy. This Convention should therefore be considered in the course of the project, and where applicable, best practices should be followed on the safe and appropriate handling of migratory species of wild animals.

3.5 Relevant Threshold Standards

3.5.1 Effluent Discharge

The IFC and World Bank Group Environmental, Health, and Safety General Guidelines (IFC and World Bank Group 2007a) have developed guidelines for effluent discharge to waters such as lakes, streams, rivers, or the ocean. The IFC and World Bank effluent threshold standards for mining, which has similar processes to geothermal drilling, are presented in Table 3-1 below for informational purposes. The temperature threshold standard is a differential of less than 3 degrees Celsius (C).

Table 3-1: Threshold Standards for Effluent Discharge

Effluent Parameter	Threshold Standards (mg/L)
Total suspended solids	50.0
pH	6 to 9
Chemical oxygen demand	150.0
Five-day biological oxygen demand	50.0
Oil and grease	10.0
Arsenic	0.1
Cadmium	0.05
Chromium (hexavalent)	0.1
Copper	0.3
Cyanide (total)	1.0
Cyanide (free)	0.1
Cyanide (weak acid dissociable)	0.5
Iron	2.0
Lead	0.2
Mercury	0.002
Nickel	0.5
Phenols	0.5
Zinc	0.5

Source: (IFC and World Bank Group 2007b)

3.5.2 Soil Toxicity

Many countries and institutions, including The World Bank, have not developed toxicity standards for soils. For reference purposes, this document has borrowed from the toxicity standards codified in the United States (U.S.), Code of Federal Regulation Title 40 Section 261.24. This has been used here because these standards underwent substantial study of impacts on human health during their adoption.

Table 3-2: Threshold Standards for Soil Toxicity

Pollutant	Threshold Standards (mg/L)

Arsenic	5.0
Barium	100.0
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.5
Chlordane	0.03
Chlorobenzene	100.0
Chloroform	6.0
Chromium	5.0
o-Cresol	4200.0
m-Cresol	4200.0
p-Cresol	4200.0
Cresol	4200.0
1,4-Dichlorobenzene	7.5
1,2-Dichlorobenzene	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	30.13
Endrin	0.02
Heptachlor (or its epoxide)	0.008
Hexachlorobenzene	30.13
Hexachlorobutadiene	0.5
Hexachloroethane	3.0
Lead	5.0
Lindane	0.4
Mercury	0.2
Methoxychlor	10.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0
Pentrachlorophenol	100.0
Pyridine	35.0
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.7
Toxaphene	0.5
Trichloroethyleene	0.5
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	2.0
2,4,5-TP (Silvex)	1.0

Vinyl chloride	0.2

Source: (U.S. Code of Federal Regulation Title 40 (261.24 n.d.)

3.5.3 Air Emissions

The World Health Organization (WHO) maintains air quality guidelines designed to "offer guidance in reducing the health impacts of air pollution" (WHO 2005). Table 3-3 summarizes the WHO's threshold standards for air emissions.

Table 3-3: WHO's threshold standards for air emissions.

Pollutant	Averaging Period	Threshold Standards (µg/m3)[2]
Sulphur dioxide (SO_2)	Annual mean	125 (interim target 1) 50 (interim target 2) 20 (guideline)
	10-minute mean	500
Nitrogen dioxide (NO_2)	Annual mean	40
	1-hour mean	200
Particulate matter with particle size between 2.5 µm and 10 µm (PM_{10})	Annual mean	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
	24-hour mean	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
Particulate matter with particle size smaller than 2.5 µm ($PM_{2.5}$)	Annual mean	35 (interim target 1) 25 (interim target 2) 15 (interim target 3) 10 (guideline)
	24-hour mean	75 (interim target 1) 50 (interim target 2) 37.5 (interim target 3) 25 (guideline)
Ozone (O_3)	8-hour mean	160 (interim target 1) 100 (guideline)
Hydrogen sulfide (H_2S)	24-hour mean	150
	30-minute mean	7

3.5.4 Noise Exposure

The World Bank's General EHS Guidelines provides maximum noise level guidelines for project-related noise. These guidelines are generally suited for permanent noise increases, such as noise associated with land use changes and permanent point sources from a facility. The project would produce temporary noise only.

[2] *The standards for SO_2, NO_2, PM_{10}, $PM_{2.5}$, and O_3 are listed in the "WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide" (2005). The standards for hydrogen sulfide are listed in the "Air Quality Guidelines for Europe" (WHO 2000). While these standards apply to Europe, the analysis of the effects of hydrogen sulfide on human health is universally applicable; therefore, the standards in this document are applied to the proposed project.*

Table 3-4 below lists the World Bank's noise level guidelines by land use type. In addition to the land use guidelines, the General EHS Guidelines state that noise levels should not exceed the existing ambient noise levels by more than 3 dBA when measured at the closest noise-sensitive receptor.

Table 3-4: Noise Level Guidelines

Land Use	Maximum Noise Level[3] (1-Hour L_{eq})	
	Daytime (7:00 to 22:00)	Night-time (22:00 to 7:00)
Residential, institutional, and educational	55 dBA	45 dBA
Industrial and commercial	70 dBA	70 dBA

Source: (IFC and World Bank Group 2007a)

Table 3-5 below lists occupational noise exposure limits. It also prescribes the required hearing protection worker exposure:

Table 3-5: Occupational Noise Exposure Limits and Required Hearing Protection

Sound Level (dBA)	Maximum Permitted Exposure (Hour/Day)	Required Hearing Protection
80	16	--
85	8	Class C
90	2	Class C/B
100	1	Class B
105	0.5	Class B
110	0.25	Class A
115	0.125	Class A
>115	0	Class A

[3] *Equivalent sound level (L_{eq}): the average A-weighted sound (dBA) level during a defined period of time.*

4 BASELINE INFORMATION

4.1 Proposed Project Area Features

The proposed Menengai West Geothermal Drilling Project is located in Nakuru County. Nakuru County borders eight counties; Laikipia County to the North East, Kericho County to the West, Narok County to the South West, Kajiado County and Kiambu County to the South, Baringo County to the North, Nyandarua County to the East and Bomet County to the West, as illustrated in figure 4-1 below.

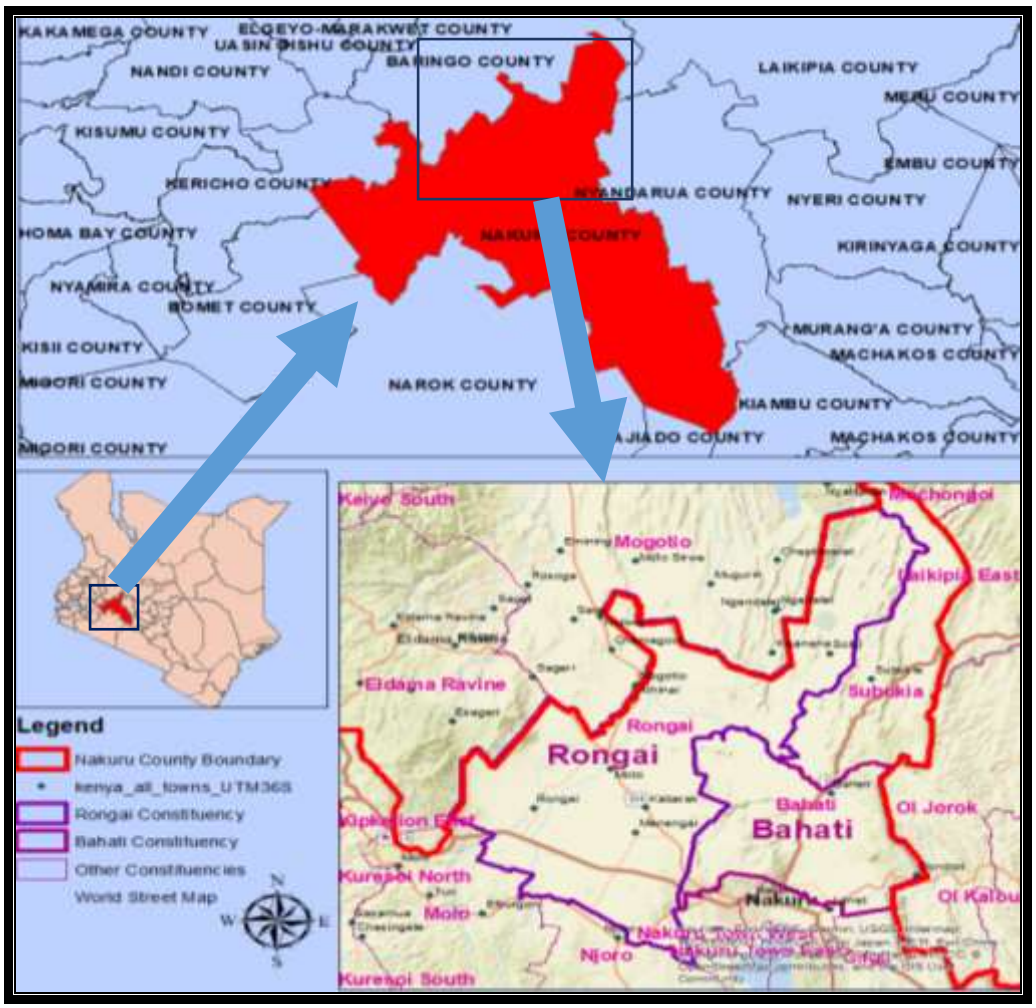

Figure 4-1: Administrative Boundaries around the proposed project area

Nakuru County covers an area of 7496.5 square kilometres and is home to 1, 603, 325 people (male – 50.2% and female – 49.8%), according to the 2009 National Census. The list of Constituencies in Nakuru County (Which also share same name and geographical boundary as the Sub Counties) is provided below.

1. **Bahati Constituency (Project Affected)**
2. **Rongai Constituency (Project Affected)**
3. **Subukia Constituency**
4. Kuresoi North Constituency
5. Kuresoi South Constituency
6. Gilgil Constituency
7. Naivasha Constituency
8. Njoro Constituency
9. Molo Constituency

10. Nakuru Town East Constituency
11. Nakuru Town West Constituency

The proposed project study area is located along the Ol'Rongai Hills located on the western side of the Menengai Caldera. The major town centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo. The study area falls on the western side of the Menengai Caldera hence its name the Menengai West Drilling Project that is mainly and extension of the latter project.

Figure 4-2 below shows relative locations of the proposed project areas within the constituencies/ sub county boundaries.

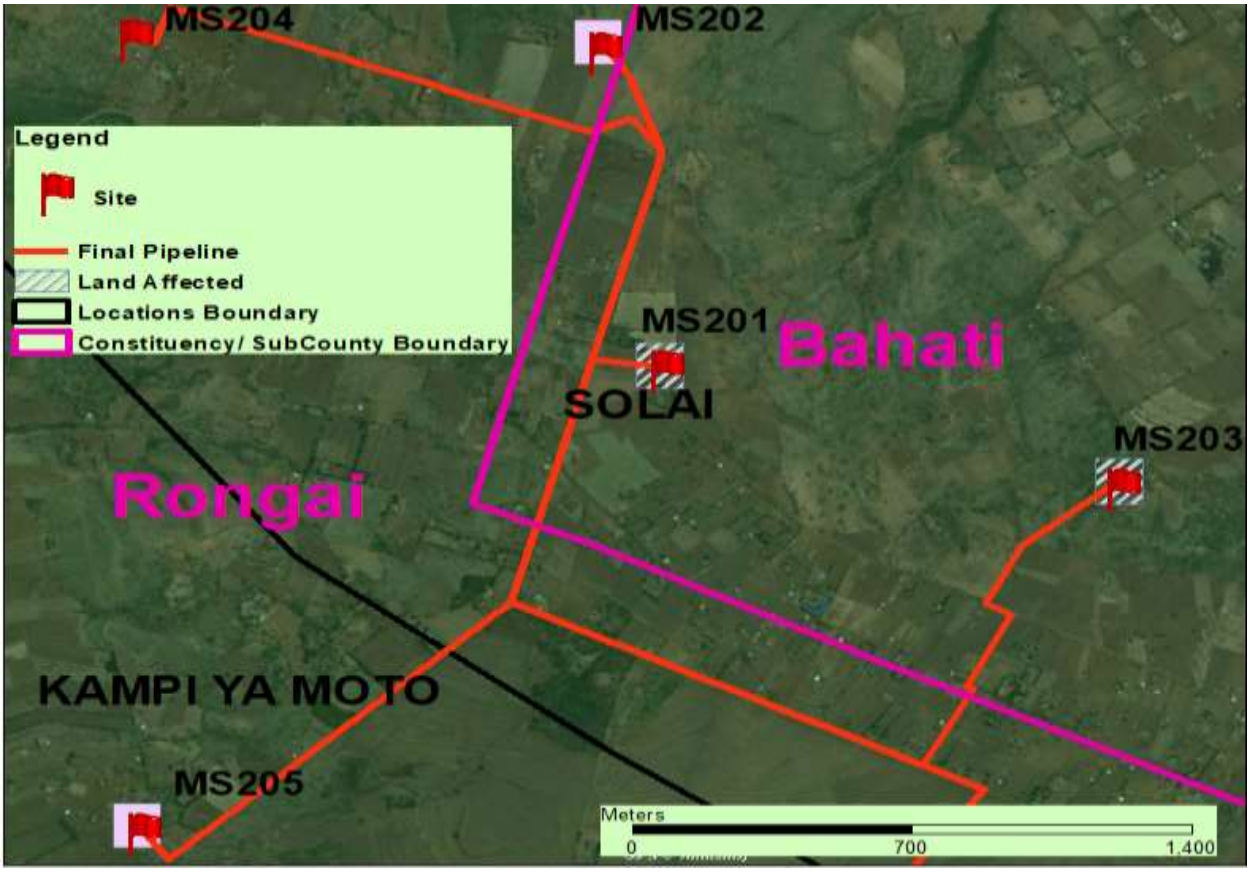

Figure 4-2: Location of the proposed projects

I. Bahati Constituency (Sub County)

Bahati Constituency (Sub County) in Nakuru County comprises of the following wards;

1. **Dundori Ward** with a Population of Approximately 24,316 residents. The sub locations are Dondori, Githioro and Mugwathi.
2. **Kabatini Ward** with a Population of Approximately 29,629 residents. The sub locations are Wendo, Thayu and Kabatini.
3. **Kiamaina Ward** with a Population of Approximately 31,345 residents. The sub locations are Rurii, Workers and Kiamaina.
4. **Lanet/Umoja Ward** with a Population of Approximately 28,011 residents. The sub locations are Mereroni and Murunyu.

5. **Bahati Ward** (**Project Affected**) with a Population of Approximately 30,965 residents. The sub locations are Chania, Matukanio, Wanyororo and Bahati.

The general, and major economic activities in Bahati Constituency (Sub County) are;

- Agriculture: Cultivating crops such as Wheat, Maize Cabbages, Fruits farming, Potatoes etc. as well as dairy and Poultry farming.
- Quarry mining: Stones and sand mining
- Tourism: Such as Camping, Mountain Climbing and or Hiking the Menengai Crater and other Scenic views.
- Real Estate sector especially in Workers area and Umoja 1.

II. Rongai Constituency (Sub County) in Nakuru County

Rongai Constituency (Sub County) comprises of the following wards;

1. **Menengai West Ward (Project Affected):** The sub locations are Olive-inn, Kamungei, Mangu and Menengai.
2. **Soin Ward**: The sub locations are Makutano, Morop, kapseteek, Lomolo, Athinai, Kokwomoi, majani Mingi and Barina.
3. **Visoi Ward:** The sub locations are Kandutura, Kapkwen, moricho, lengenet, Boito, Umoja, Gicheha and Kampi.
4. **Mosop Ward:** The sub locations are Matuiku, Chepseon, Summek, Mimwaita, Ngata, Kirobon, Milimani and Ogilgei.
5. **Solai Ward** (**Project Affected**): The sub locations are Chemasis, Nyamamidhi, Emarangishu, Arusto, lower solai, Koisamo and Arutani

The major economic activities in Rongai Constituency (Sub County) are;

- Dairy Farming
- Horticulture and Floriculture
- Trade and Investment
- Fruits farming
- Maize, Wheat, Potatoes, Tomatoes among others.

III. Subukia Constituency in Nakuru County

Subukia Constituency (Sub County) comprises of the following wards;

1. **Subukia Ward:** The sub locations are Magomano, Arashi, Tetu, Subukia East and Munanda.
2. **Waseges Ward:** The sub locations are Gitundaga, Lari, Wiumiririre, Kianoe, Simboiyon, Mihango.
3. **Kabazi Ward**: The sub locations are Nyadundo, Ruiru, Kirima, Ndingiri, Rugongo and Kabazi.

The major economic activities in Subukia Constituency (Sub County) are;

- Dairy Farming
- Coffee and Tea Farming
- Horticulture and Floriculture
- Fruits farming

- Trade and Investment
- Maize, Wheat, Potatoes, Tomatoes etc.
- Tourism: Such as Camping, Mountain Climbing and or Hiking the Catholic Maryan Shrine in Subukia and other Scenic views.

4.1.1 Population and Area

As already mentioned, Nakuru County is divided into eleven sub-counties and 55 wards. The county curved up in 31 Divisions, 124 Locations and 280 Sub-Locations.

This proposed project affects three sub-counties: Rongai, Bahai and Subukia.

a) **Rongai Sub-County**

This Sub-County has five wards. Solai Ward is affected by the proposed project. The area and population of the wards is as highlighted below:

Table 4-1: Population in Rongai Sub-County

Ward	Area In Km²	Population
1. Menengai West	118.7	31,499
2. Soin	292.5	28,209
3. Visoi	204.9	35,438
4. Mosop	197.2	30,556
5. Solai	235.8	21,315
Total	**1049.1**	**147,017**

b) **Bahati Sub-County**

This Sub-County has five wards, with a total population of 162,985 as shown in the table below:

The area and population of the five wards is as follows:

Table 4-2: Population in Bahati Sub-County

Ward	Area In Km²	Population
1. Dundori	54.9	27,471
2. Kabatini	62.1	33,473
3. Kiamaina	52.1	35,412
4. Lanet/Umoja	50.2	31,646
5. Bahati	156.1	34,983
Total	375.4	162,985

c) **Subukia Sub-County**

This Sub-County has three wards: Subukia, Weseges and Kabazi. With a total population of 106, 737.

The area and population of the three Subukia's wards is as follows:

Table 4-3: Population in Subukia Sub-County

Ward	Area In Km2	Population
1. Subukia	89.11	23,895
2. Weseges	172.7	38,303
3. Kabazi	128.9	44,538
Total	390.71	106,737

4.2 Socio-Economic Survey

4.2.1 Demographics Data

a) Population

Upon compilation and analysis of the data, it was revalidated in the field. Key results of the research are as follows:

Majority (93%) of the respondents were from Rongai and Subukia sub counties where as 7% came from Bahati. The latter therefore signifies that the major part of the proposed project lies in Rongai Sub County.

b) Gender

Majority (80%) of the respondents interviewed were male whereas 20% were females. In terms of age, most respondents 38% were aged between 46-60yrs followed by 36-45 years who were 33%. Those aged between 26 -35 were 14% while those above 60 years were 10%. Only 5% of the respondents were aged between 18 -25 years. Figure 4.3 and 4.4 below shows gender and age distribution respectively.

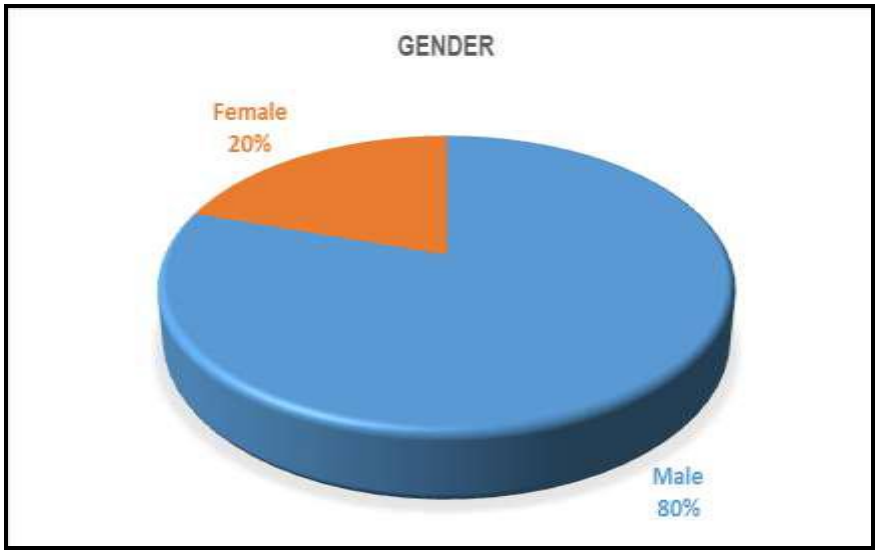

Figure 4-3: Respondents Gender Distribution

c) Age

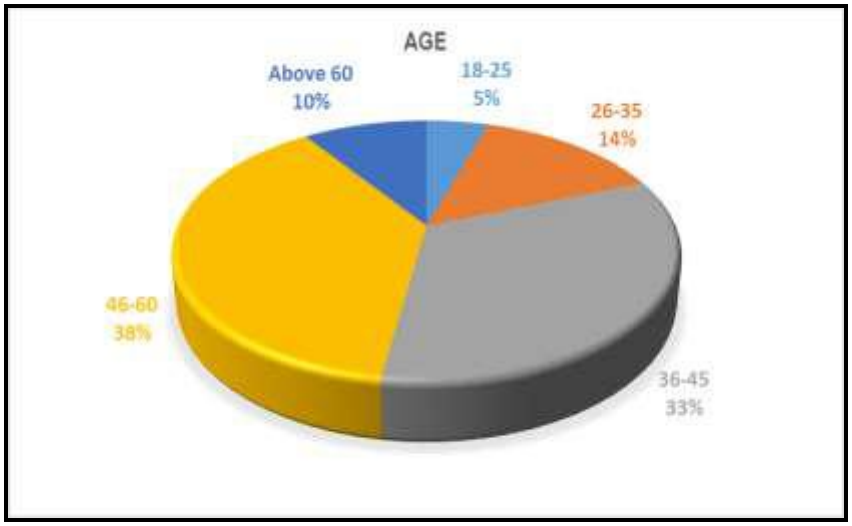

Figure 4-4: Respondents Age Distribution (years)

d) Marital Status

When the respondents were asked to state their marital status, majority of the respondents 85% stated married, 10% of the remaining respondents had never married while the rest 5% had were divorced. None of the respondents indicated having been separated or widowed.

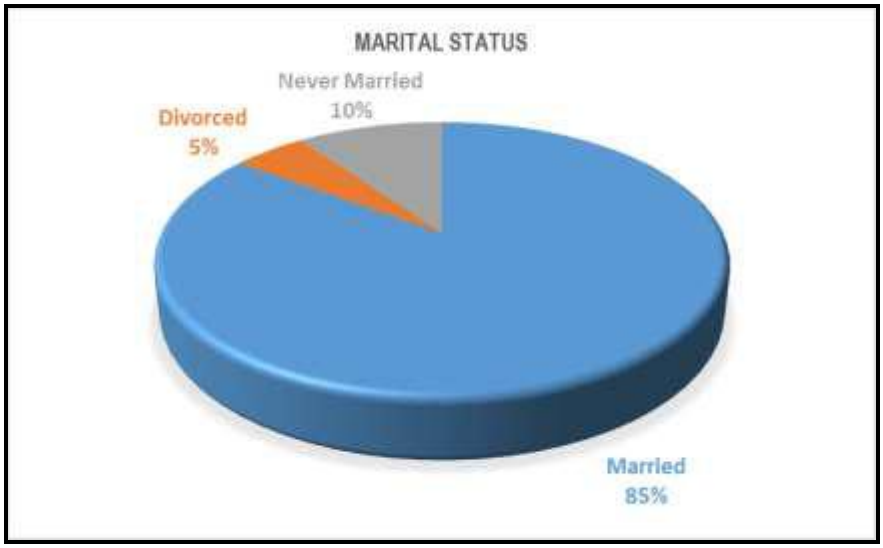

Figure 4-5: Respondents Marital Status

From socio-economic data analysis, majority of the married respondents (75%) had children below 18 years while the rest 25% had no children in the bracket of age. Figure 4.6 below shows the percentage of those with children below 18 years.

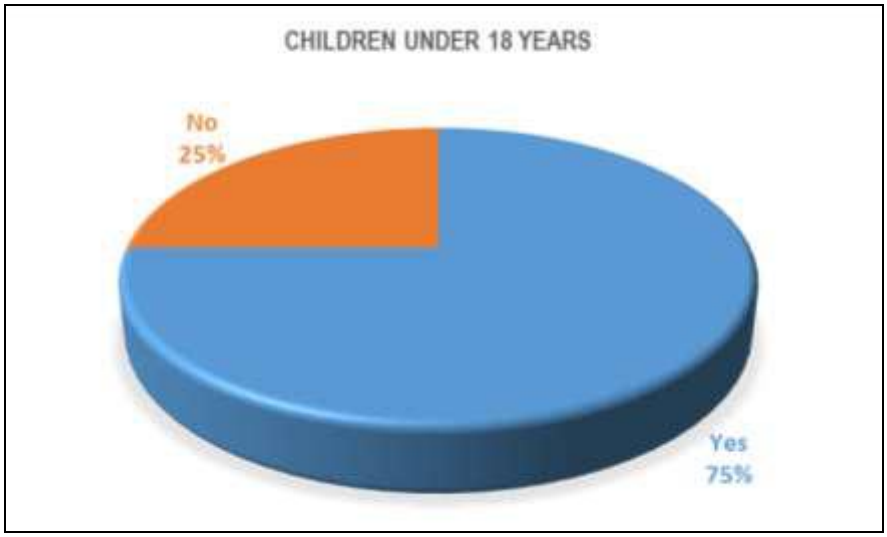

Figure 4-6: Children under 18 years

4.2.2 Education Levels

Education is essential for development and plays a key role in the realization of our national goals. Our findings on education levels of the people are presented in figure 4.7. Majority of respondents 67% have attained high school education, 13% had attained basic primary education followed by 10% attaining college. It was also observed that 5% had attended pre-primary where the 3% had attended adult education and the rest 2% had never received any form of education.

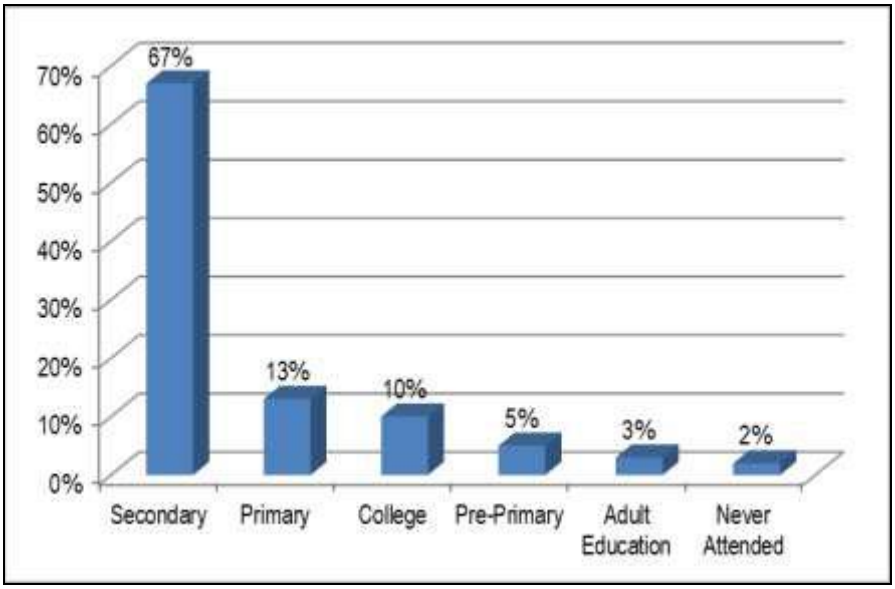

Figure 4-7: Highest level of education attained by respondents

When the respondents were asked to state how much time they take to access the nearest school from their homesteads, a majority 60% indicated less than 20 minutes. This indicates that the schools were less than a kilometre away. It was however observed that 30% of the respondents took between 21 to 40 minutes while the remaining 10 % took between 41-60 minutes to get to the nearest school. This is presented in Figure 4.8.

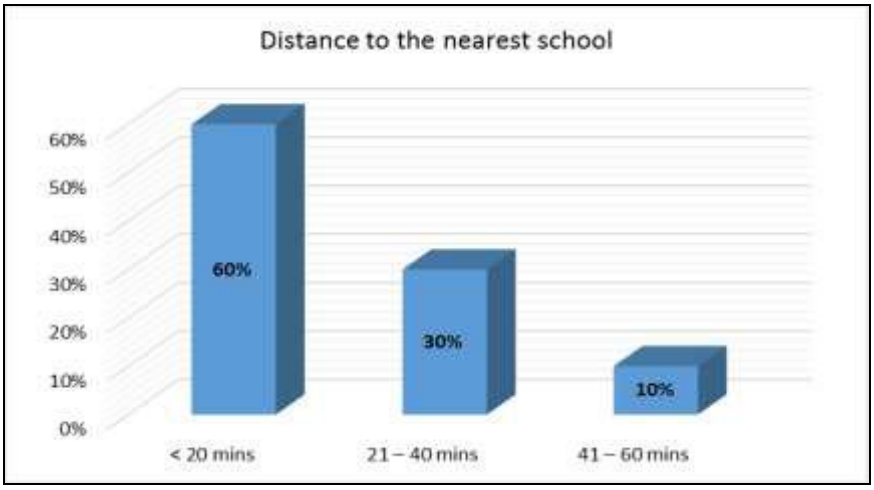

Figure 4-8: Distance to the nearest school

4.2.3 Housing Structure

The standard and quality of dwelling places are manifestations of economic growth and development. The types of houses in the proposed project area comprised of temporary/semi-permanent houses mostly with mud walls and iron roofed. Figure 4.8 illustrates the types of the houses found in the proposed project area.

Figure 4-9: common types of houses around the Area

It was observed that the majority 50% of the respondents lived in semi-permanent houses followed closely with 45% of the residents living in permanent houses. Only 5% of the respondents lived in temporary houses.

In terms of housing materials, majority (51%) of respondents had wood and mud walls, 32% had stones and cement done, while 10% had done their walls on iron sheet. This figure indicates why most houses were semi-permanent. Figure 4.10 below indicated the material on wall used for construction in the two sub counties.

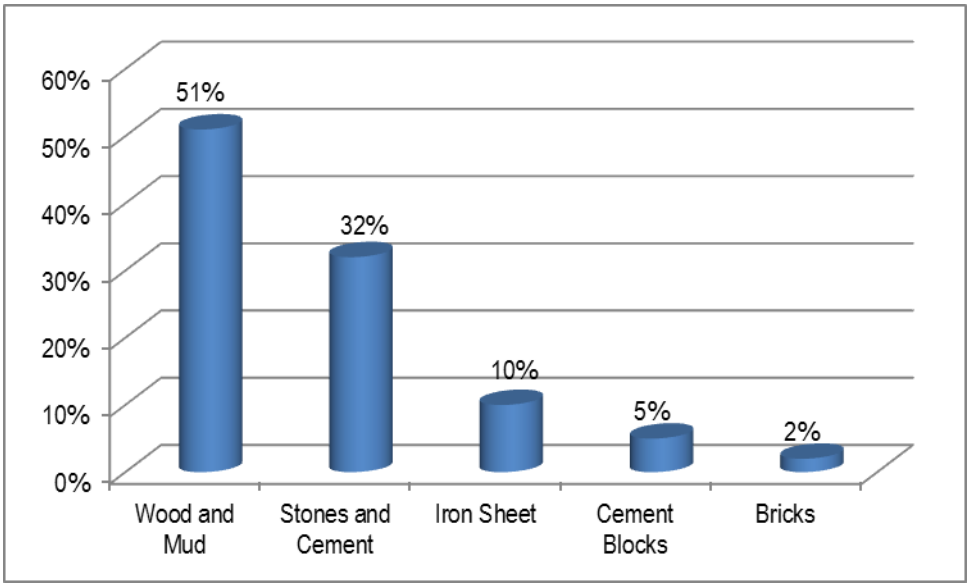

Figure 4-10: Respondent's wall material

Under roofing materials, majority 69% of the respondents used iron sheets, 19% had roofed their houses with mud while the rest 12% had thatch on their roofs (Figure 4.11) in terms of roofing structure.

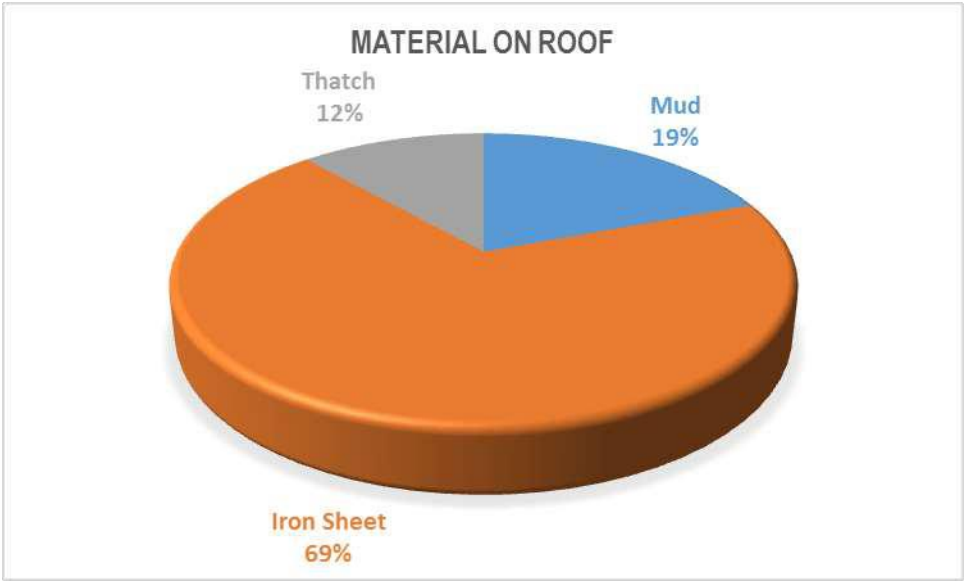

Figure 4-11: Respondent's roofing material in Project Area

4.2.4 Health and Vulnerability

According to the socio economic survey conducted within the proposed project area, 45% of the respondents take between 41-60 minutes to access the nearest health care facility, followed by 25 % who took 21 – 40 minutes. 20% took less than 20 minutes while the remaining 10% took more than an hour. Figure 4.12 represents the outcome of the survey regarding accessibility to health facilities.

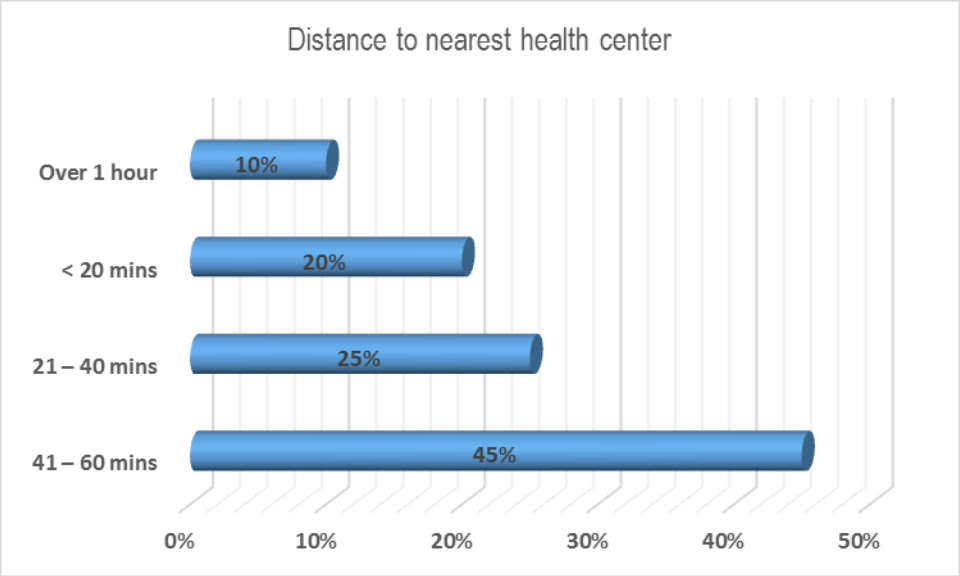

Figure 4-12: Accessibility to health facilities

The analyses from the household socio-economic data indicated 35% of the respondents are disabled indicating a significant number of vulnerable persons within the area. (Fig 4-12)

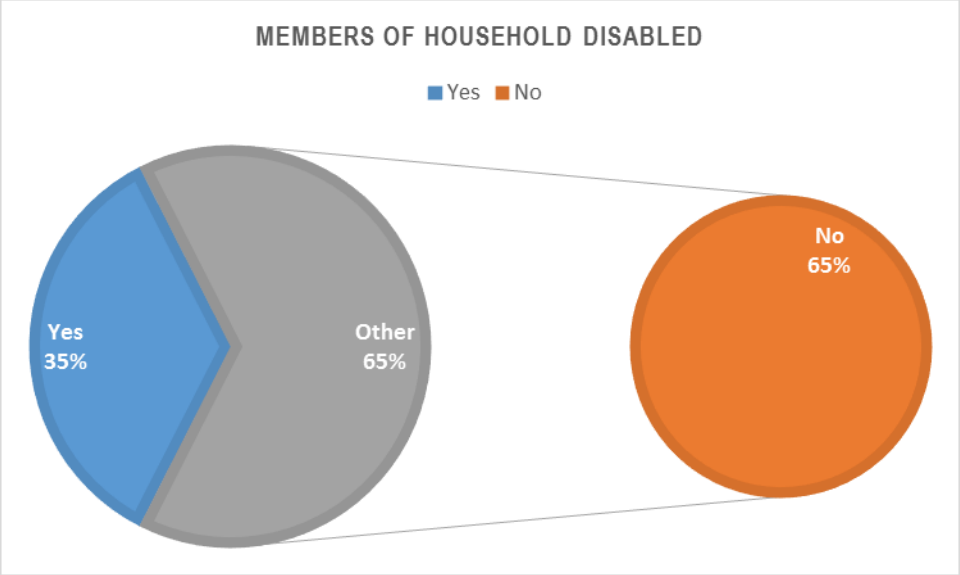

Figure 4-13: Disabled household members

The nature of disability among respondents varied among the interviewed respondents; for those who reported having disabled members, 38% reported having lame members, 29% stated blind followed by 17% who indicated having deaf members and 13% had crippled members. It was however noted that few 4% of the respondents had other forms of disabilities. (Figure 4.13)

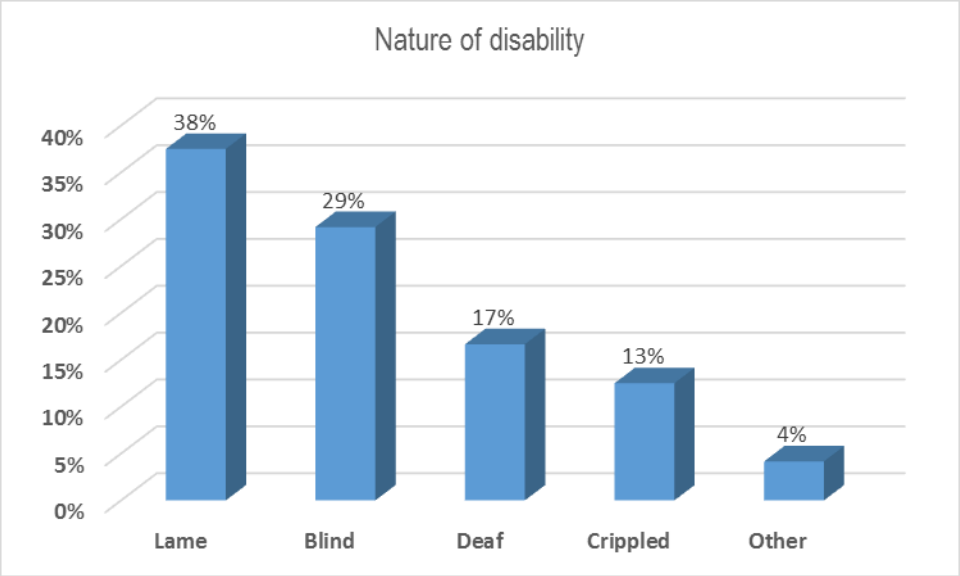

Figure 4-14: Nature of disability

When the respondents were asked if they had ill members within the past four months; 70% of the respondents agreed while the rest 30% had none of their members' sick within the four months. Fig 4-14)

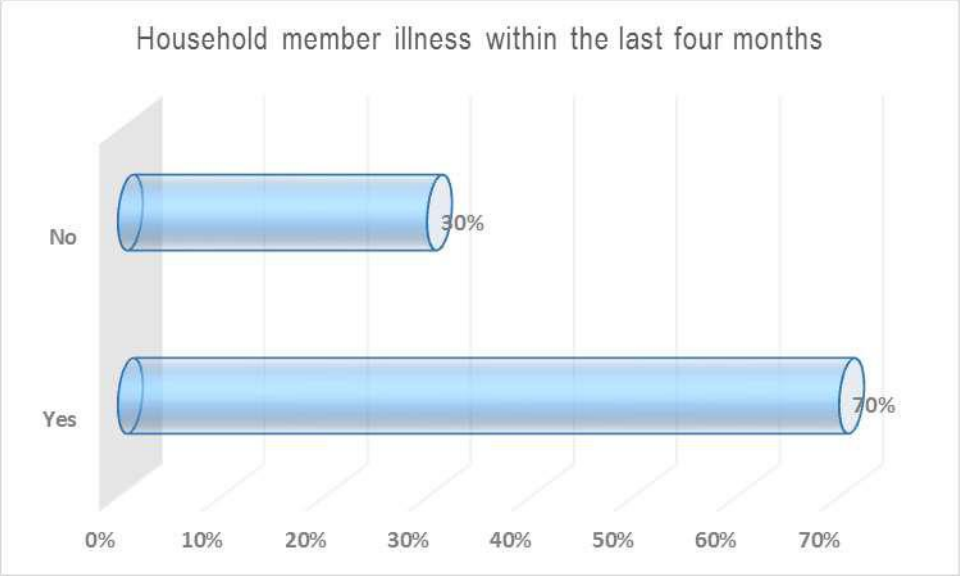

Figure 4-15: Record of illness within the last four months

Common diseases within the proposed project area at the time of survey included malaria accounting for 32 % of the diseases, Flu/Cough with 29%, headaches 18%, stomach disorders at 11%, followed by 7% who reported having diarrhoea. The rest 4% indicated having other forms of illnesses. (Fig 15)

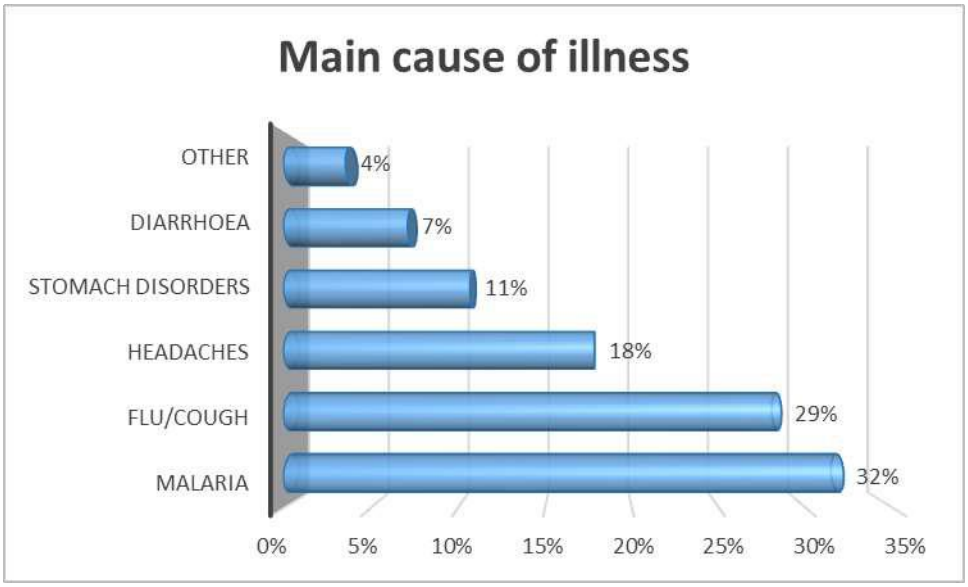

Figure 4-16: Types of diseases common in the proposed project area

It was also observed that majority (52%) of respondents residing within the two sub counties have access to piped water (Fig 4-16). However, the sources of water seem to be very far from the individual resident's location. Majority (51%) of the respondents take 41-60 minutes followed by 32% who said it takes them more than an hour. Water is a major problem in these two sub counties and GDC should factor these issues as part of their CSR activities.

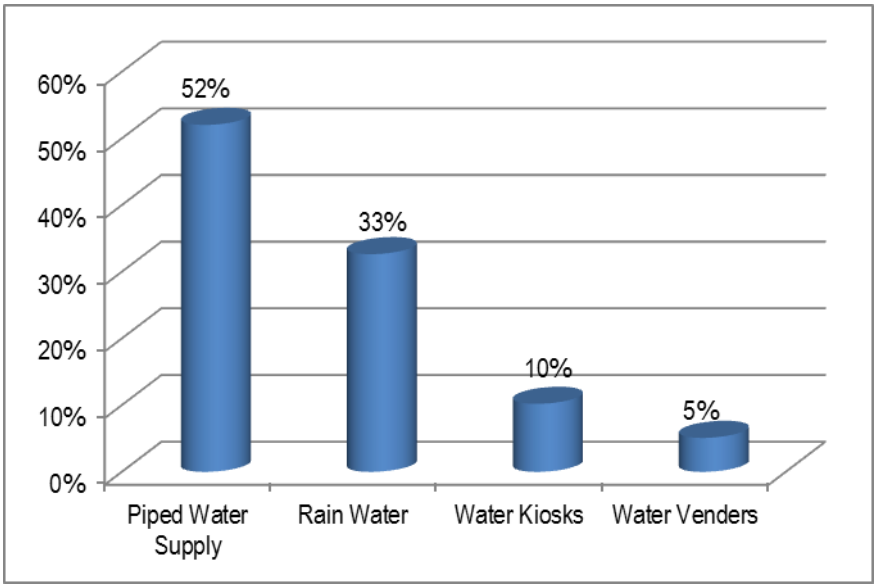

Figure 4-17: Types of diseases common in the proposed project area

Figure 4-17 below indicates the time taken to access the nearest domestic water source.

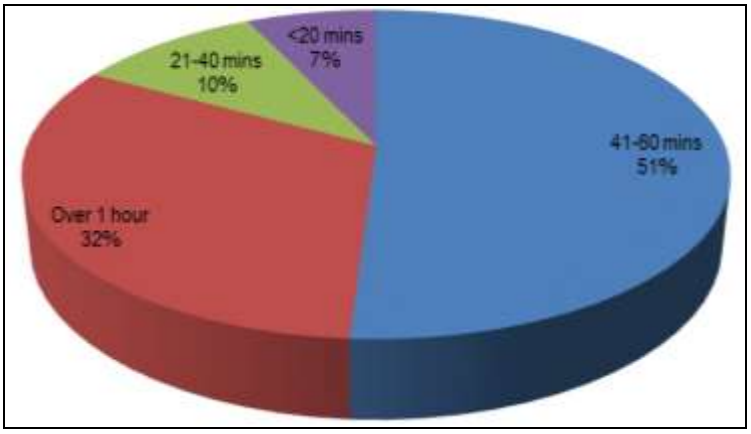

Figure 4-18: Distance to the nearest water source

In terms of safety measures considered before drinking water, majority 82% said they drink directly without boiling, using chemicals, filtering or decanting (Figure 4.18). This factor is mainly attributed to the fact that piped water is usually considered safe for drinking since it is already treated.

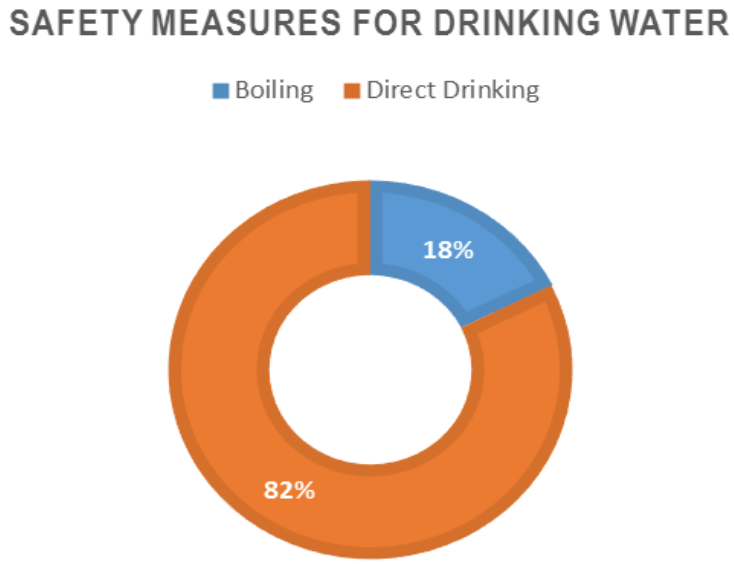

Figure 4-19: Safety measures before drinking water

It was also important to analyse the waste sanitation facilities available in the respondent's vicinity. As evident from the questionnaires answered, majority 95% of the respondents had toilet facilities within their compound (Figure 4.19). Of those with toilets, 90% of the respondents had simple latrines.

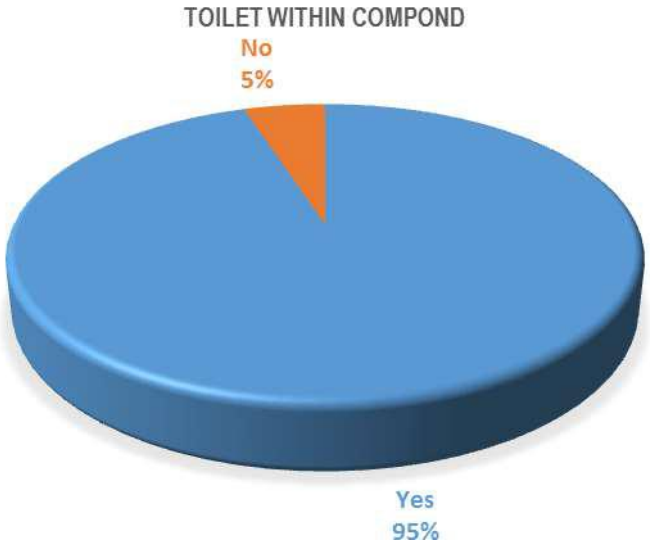

Figure 4-20: Presence of toilet within compound

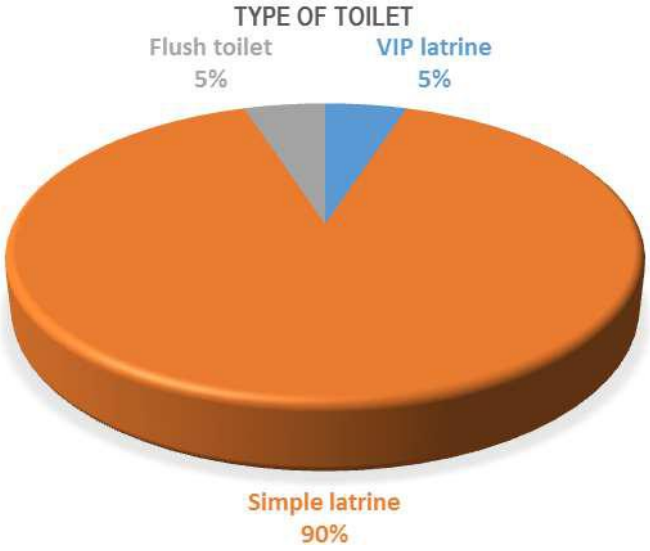

Figure 4-21: Types of toilet common in the area

4.2.5 Land Ownership

Land in Rongai, Subukia and Bahati is mainly private land (adjudicated). However, these lands are mainly used for crop growing and livestock farming. Mixed farming is predominant throughout the county. There is a significant change in land use in the urban areas where industrial and commercial use is gaining momentum.

In general, Rongai, Subukia and Bahati Sub Counties is characterised with big pieces of land mainly used for agriculture. From observations and focused group discussions, majority 85% of the respondents said they either owned land or have a form of ownership attaching them to a particular land (Figure 4-22). Majority 68% of those with land have over 5 acres. Figure 4-22 and 4.21 shows the distribution of respondents in terms of land ownership and acreage in the two sub counties.

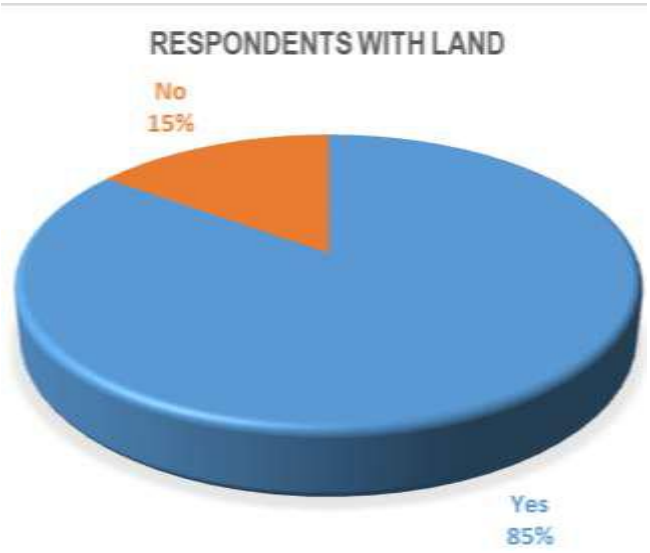

Figure 4-22: Land ownership pattern the proposed project location

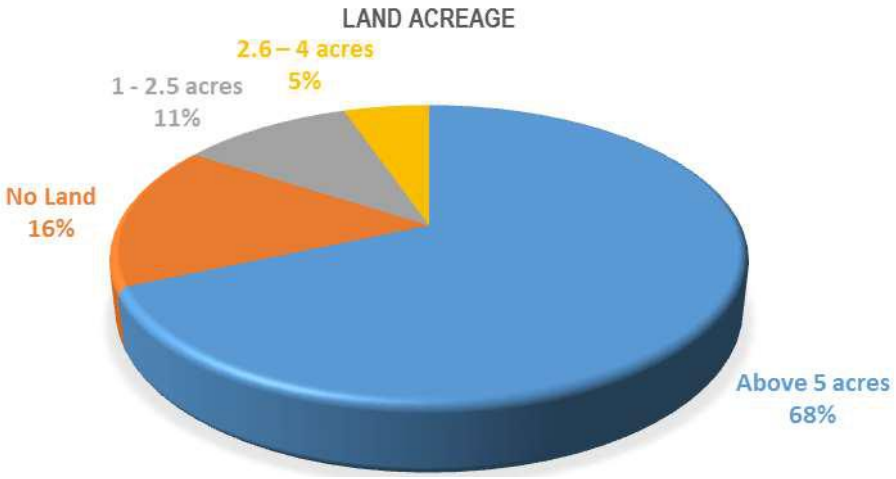

Figure 4-23: Land ownership pattern in Proposed project Area

4.2.6 Economic Activities

Our survey revealed that majority 65% of the respondent's practices crop farming as the main source of farming (Figure 4-24). Even though some respondents 35% indicated livestock keeping as main source of income, some crop farmer still kept livestock as secondary source of income.

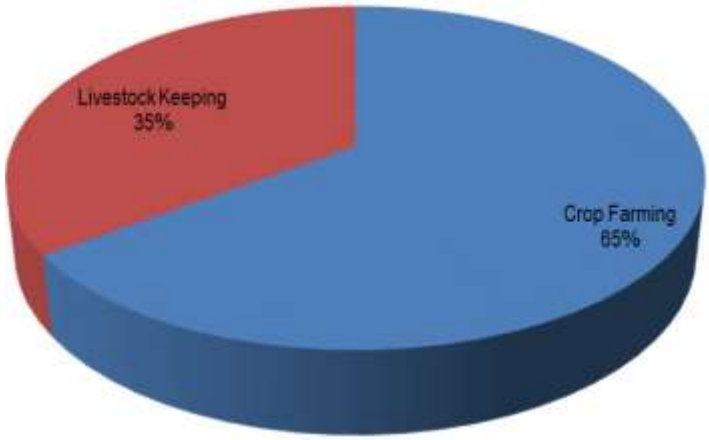

Figure 4-25: Main source of income within the proposed project area

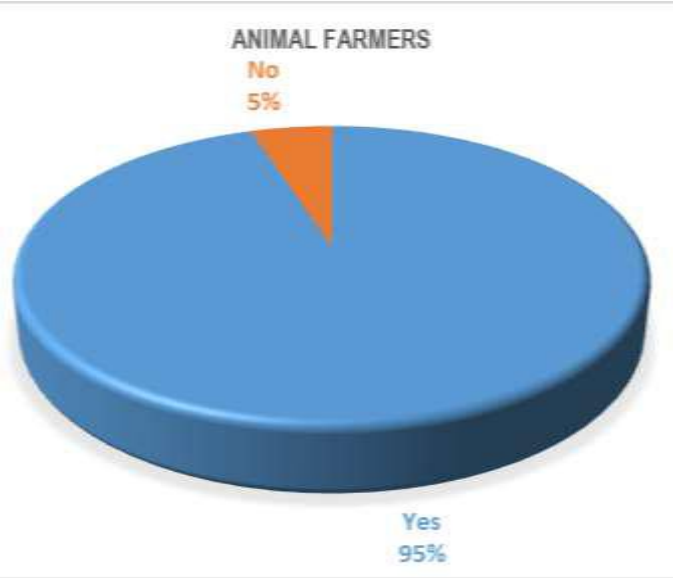

Figure 4-26: Percentage of farmers rearing animals

Even though livestock keeping is not the dominant economic activity in the two sub counties, a considerable number of respondents indicated relying on this activity as a source of income. Majority 32% of the respondents interviewed reared cattle, 26% had goats, 22% reared sheep, 10% did poultry farming, 8% had donkeys while the rest kept camels. Figure 4.26 shows the main types of livestock reared in the proposed project area.

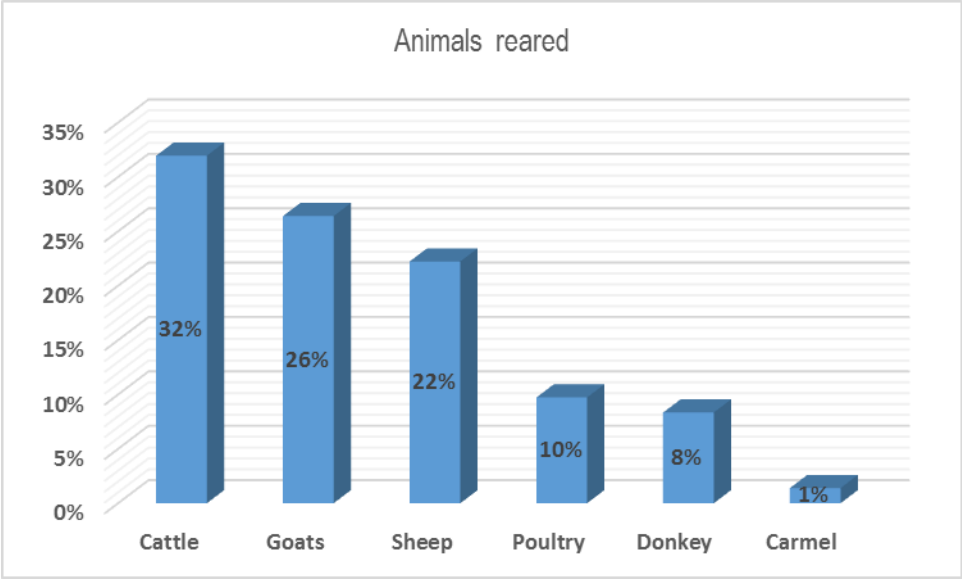

Figure 4-27: Main type of livestock reared in the proposed project area

Figure 4-28:livestock types in the area

Crop farming is mainly considered the main activity in Rongai, Subukia and Bahati Sub Counties; however, animal farming was also dominant. The majority 45% of respondents cultivated maize, 37% cultivated beans, 8% cultivated vegetables, 5% wheat, 3% did onion farming while the rest 2% tomatoes. Figure 4-28 indicates the crops cultivated in the two sub counties.

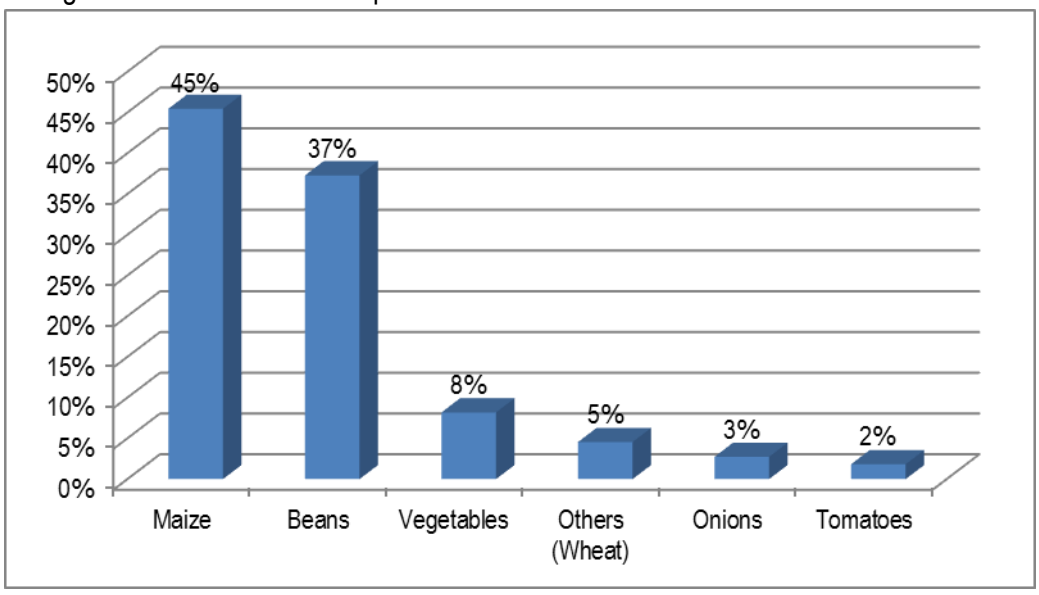

Figure 4-29: Crops cultivated by respondents along the proposed project site

4.2.7 Proposed project Awareness

One of the ultimate factors for conducting a full ESIA study was to enhance project awareness. Building up from the previous studies, awareness was created for the proposed project potential impacts and on how mitigation measures will be implemented (including compensation payment and handling of relocation). Majority of the respondents were now aware of the proposed project ESIA study.

4.3 Environmental Description

4.3.1 Description of study sites

The proposed project area, the study area, was divide into five sites namely MS 201, MS 202, MS 203, MS 204 and MS 205. Each of the proposed project site measured 120m by 140m. MS 202, MS 203, MS 204 and MS 205 sites consisted both cultivated land (disturbed land) and natural habitat (undisturbed land) whereas site MS 201 was purely a cultivated land.

A field study was conducted within and around the proposed five project sites. A baseline study to determine the diversity of plant and animal species in the area before the exploration is important for

restoration purposes after the exploration since key habitat changes affect sensitive species which may decline or disappear while still undocumented. Determination of soil types is also important since this affects the plants diversity in a given area. Therefore, the main objective of this study was-:

- To characterize and document the diversity of plant species in the study area
- To document the animal species in the study area
- To determine the soil types in the study area

4.3.2 Physical and Topographic Features

The proposed project is located on the northern side of Nakuru town along the western slopes of Menengai crater. The Menengai crater stands about 2100m a.m.s.l to the eastern side of the proposed site. The slope is composed of volcanic soils that are highly susceptible to erosion. An intercalation of sedimentary and volcanic rocks line most of the landscape.

4.3.3 Climatic Conditions and Changes

Generally, the climatic features in the Rift Valley, including the proposed project area, are closely related to the altitudinal changes and variations induced by the local topography. The proposed project area is classified into two main agro-climatic zones. The lowland areas of Mogotio and Kisanana in the north are located in semi-arid zone IV with an annual rainfall of 800 mm and mean temperatures of 30°C. Njoro, Bahati and parts of Kampi ya Moto divisions with an altitude of between 1800 m and 2400 m above sea level and average rainfall of between 760 mm and 1270 mm per year fall within a dry sub-humid equatorial climatic zone.

The proposed project area experiences bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May, the mean rainfall is approximately 900mm. Temperatures in the county ranges from a high of 29.3^{o} C between the months of December, January, February, and part of early March to low temperatures of up to 12^{o} C during the month of June and July (Nakuru CIDP)

The proposed project is considered one of the clean energy projects with no known severe direct impacts on climate change. However, the proposed project may have indirect impacts on climate change since the source of energy for some people in the area is firewood and the project would provide access to the forests in the caldera.

4.3.4 Soils

Generally, the soils within Menengai West proposed project area can be categorized as exposed older lava flows, flat grounds and the Menengai volcano. The soil profiles of these areas are shallow, stony and saline. They are also highly susceptible to runoff erosion.

Characterization of soil types in the proposed sites: Based on soil physicochemical characteristics, the soils in the five sites were classified as:

Table 4-3: Summary of topsoil description within the proposed project area

Proposed Project Site	Soil Description
MS 201	Volcanic formed rich dark loam soils, which enrich the farmlands around the proposed project site
MS 202	Volcanic formed rich dark loam soils, which enrich the farmlands around the proposed project site

MS 203	Sandy loam; some sections of the proposed project area are covered by trap rock
MS 204	Red loam soil
MS 205	Sandy loam; some sections of the proposed project area are covered by trap rock.

4.3.5 Air Quality and Noise

Like in many parts of the country, both indoor and outdoor air quality would be of interest. Outdoor air pollution is defined as percentage population exposed to aerosols greater than AOD[4] of 0.4 (AOD value of less than 0.1 indicate clear sky) while indoor air pollution refers to percentage of population using wood fuel as energy source and causing health risk.

According to NEMA's latest environmental performance index, Nakuru county recorded average AOD of 0.04 indicating that outdoor air pollution is not a major concern. The county also reports about 14% of the population using wood fuel. With regard to noise, the proposed project area is in a rural setting with no vehicular or industrial activities.

4.3.6 Biodiversity of Plant Species within the Study Area

A baseline study to determine the diversity of plant and animal species in the area before the exploration is important for restoration purposes after the exploration since key habitat changes affect sensitive species which may decline or disappear while still undocumented.

Figure 4-29: Property owner assists in line transects sampling of vegetation species within MS 205

Plant Sample Collection and Processing: Line transects were established in the sites and used as baseline upon which sampling plots were located. Plant samples were then collected on four points

[4] *Aerosol Optical Depth (AOD) is a measure of the extinction of the solar beam by dust and haze. AOD tells us how much direct sunlight is prevented from reaching the ground by these aerosol particles. It is a dimensionless number that is related to the amount of aerosol in the vertical column of atmosphere over the observation location. The data is obtained from Aerosol Optical Depth (AOD) from NASA's MODIS*

measuring 5m by 5m placed at 10M *intervals*. The collected plant samples included-: whole plants, whole leaves, whole branches, flowers and fruiting bodies. Each sample was immediately placed in a well labelled khaki bag after collection for preservation awaiting identification. Herbarium was established for all the plant types collected in the entire study area and identification of plant samples was conducted by comparing with specimens kept in an established herbarium and botanical literature.

Figure 4-30: sampling of different grass species within proposed project sites

Figure 4-31: Property owner participates in the vegetation sampling and identification (MS 203)

Figure 4-32: Uncultivated vegetation section of MS 204

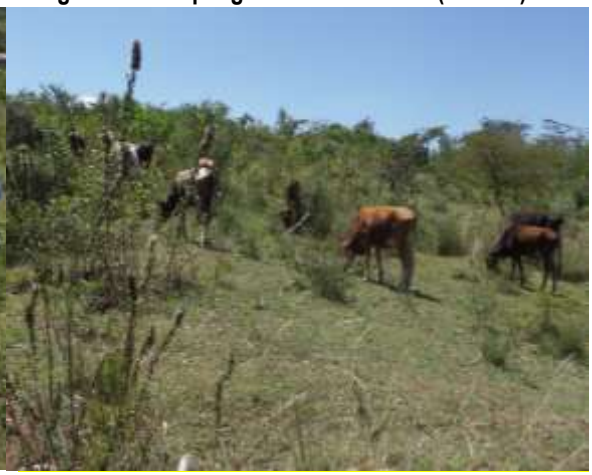

Figure 4-33: Vegetation cover uncultivated section of MS 202

Results obtained from this study shows that the study sites consist of four plant communities namely-: **Trees**, **Herbs**, **Grasses** and **Shrubs**. The tree species ranged from 5 in site MS 205 to 7 in both site MS 202 and MS 203.

4.3.6.1 Trees Species

Acacia hockii and *Ozoroa insignis reticulata* were the most prevalent tree species occurring in all the sites whereas *Jacaranda mimosifolia* and *Erythrina abyssinica* were the least prevalent occurring in only one site each (Table 4-4 below).

Table 4-4: Dominant trees collected in the proposed project sites

No	Family	Scientific Name	Common Name	MS 205	MS 204	MS 202	MS 201	MS 203
1	Fabaceae	*Acacia hockii*	Acacia	X	X	X	X	X
2	Fabaceae	Vachellia abyssinica	Flat top acacia		X			X
3	Fabaceae	*Erythrina abyssinica*	Abbysianian coral tree				X	
4	Moraceae	*Ficus thonningii*	Fig tree			X		X
5	Moraceae	*Ficus glumosa*	Mountain fig	X		X		X
6	Anacardiaceae	*Ozoroa insignis delile*		X		X		
7	Myrtaceae	*Eucalyptus globulus*	Blue gum		X		X	
8	Proteaceae	*Grevillea robusta*	Grevillea		X		X	X
9	Bignoniceae	*Jacaranda mimosifolia*	Jacaranda	X				
10	Euphobiaceae	*Euphobia tiricalli*	Milk bush					X
11	Anacardiaceae	*Ozoroa insignis reticulata*	Ozoroa	X	X	X	X	X
12	Euphorbiaceae	*Croton macrostachyus*	Broad leaf croton	X		X	X	
Total				6	5	7	6	7

Key: X-site species was identified

Other trees species that are generally available in the wider project region includes*: Urtica massaica, Zehnesia scabra, Dracena steudneri, Senra didymobotrya, Ficus thonningii, Orobanche minor, Olea europea, Pentas lanceolata, Cuscuta kilimanjari, Croton macrostachyus, Erythrococca bongensis, Solanum mauense, Mansonia angustifolia, Nuxia congesta, Agauria salicifolia, Acacia abyssinica and Acacia hockii, Tarconathus camphorates, Euphorbia candelabrum, Acacia drepanolobium, Rhus natalensis, Grewici similes, Acacia tortilis, Cussonia arborea, Kleinia abyssinica, Commelina bengalensis. Aspilia mossambicensis, Tinnea aethiopica, Justica calyculata, Rhoicissus tridentate, Oxalis corniculata, Rhus vulgaris, Ozoroa insignis, Erythrina abyssinica, Celosia anthelmintica, Pentas longiflora, Dioscorea quartiniana, Heteromorpha trifoliate, Tetradenia riparia, Faurea saiiqna, Echinops amplexicaulis.*

4.3.6.2 Herbs

Herbs species ranged from 19 in site MS 203 to 27 in sites MS 205 and MS 204. *Conyza stricta, Galinsoga parviflora, Vernonia galamensis, Achyranthes aspera, Ageratum conyzoides, Targetes minuta, Solanum nigrum* and *Berkheya rigida* were the most prevalent herbs species occurring in all the five sites whereas *Monsonia angustifolia* and Ocimum *gratissimum* were the least prevalent occurring in only one site each (Table 4-5 below).

Table 4-5: Dominant Herbs species collected in the proposed project sites

No	Family	Scientific Name	Common Name	MS 205	MS 204	MS 202	MS 201	MS 203
13	Euphorbiaceae	*Cynoglossum coeruleum*	Forget me not	X	X	X	X	X
14	Compositae	*Conyza sumatrensis*	Broad leaved fleabane		X		X	X
15	Compositae	*Conyza bonariensis*	Hairy fleabane	X	X	X	X	
16	Compositae	*Conyza stricta*	Narrow leaved fleabane	X	X	X	X	X

17	Oxalaceae	*Oxalis corniculata*	Oxalis	X	X	X	X	
18	Urticaceae	*Girardinia diversifolia*	Himalayan nettle	X	X		X	
19	Rosaceae	*Rubus steudneri*	Black berries	X				X
20	Rosaceae	*Rubus apetalus*	Black berries				X	
21	Solanaceae	*Solanum mauritianum*	Tobacco weed	X		X		X
22	Compositae	*Galinsoga parviflora*	Macdonalds eye	X	X	X	X	X
23	Asteraceae	*Vernonia galamensis*	Iron weed	X	X	X	X	X
24	Amaranthaceae	*Achyranthes aspera*	Devil's Horse Whip	X	X	X	X	X
25	Compositae	*Ageratum conyzoides*	Chick weed	X	X	X	X	X
26	Compositae	*Bidens pilosa*	Black jack	X	X	X	X	X
27	Commelinaceae	*Commelina benghalensis*	Wandering jew	X	X	X	X	
28	Compositae	*Crassocephalum montuosum*	Thick head		X	X		
29	Solanaceae	*Datura stramonium*	Jimson weed	X	X			
30	Sapindaceae	*Dodonaea angustifolia*	Sand olive			X		X
31	Amaranthaceae	Amaranthus retroflexus	Pig weed	X	X	X		
32	Lamiaceae	*Ocimum gratissimum*	African Basil					X
33	Polygalaceae	*Polygala erioptera*	Milkwort	X		X		
34	Lamiaceae	*Fuerstia africana*	African mint	X		X	X	
35	Compositae	*Targetes minuta*	Mexican marigold	X	X	X	X	X
36	Solanaceae	*Solanum nigrum*	Black night shade	X	X	X	X	X
37	Compositae	Schkuhria pinnata	Dwarf Mexican marigold	X	X	X	X	X
38		Monsonia angustifolia	Monsonia		X			
39	Portulacaceae	Portulaca oleracea	Common Purslane		X			
40	Amaranthaceae	*Amaranthus spinosus*	Spiny Amaranth	X	X	X		
41	Scrophulariaceae	*Striga asiatica*	Witch Weed	X	X	X		X
42	Rubiaceae	*Oldenlandia wiedemannii*	Not given			X	X	
43	Cucurbitaceae	*Zehnesia japonica*	Zehnesia	X				X
44	Rubiaceae	*Urtica massaica*	Common nettle	X			X	X
45	Compositae	*Gutenbergia cordifolia*			X	X		
46	Compositae	*Berkheya rigida*	African thistle	X	X	X	X	X
47	Compositae	*Berkheya armata*	Vlakedoring		X		X	
48	Compositae	*Guizotia scabra*	Sunflecks	X	X		X	
49	Compositae	*Emilia discifolia*	Tassle flower	X	X	X	X	
Total				**27**	**27**	**25**	**22**	**19**

Key: X-site species was identified

4.3.6.3 Grass Species

The range for grass species was between 7 in sites MS 202 and 203, and 10 in site MS 204 where the most common type of grass species was *Cydon aethiopicus* occurring in all the five sites and *Hyparrhenia rufa* was the least common occurring in only one site (Table 4-6).

Table 4-6: Dominant grasses species collected in the proposed project sites

No	Family	Scientific Name	Common Name	MS 205	MS 204	MS 202	MS 201	MS 203
50	Poaceae	*Panicum maximum*	Guinea grass	X	X	X	X	
51	Poaceae	Melinis repens	Natal grass	X			X	X
52	Poaceae	*Cydon aethiopicus*	Star grass	X	X	X	X	X
53	Poaceae	*Cenchus cellanis*	Foxtail grass		X	X	X	
54	Poaceae	*Chloris gayana*	Rhodes grass	X	X		X	X
55	Poaceae	*Themeda triandra*	Kangaroo grass		X			
56	Poaceae	*Cenchus cellanis*	Foxtail grass	X	X	X	X	
57	Poaceae	*Harpachne schimperi*	Not given			X		X
58	Poaceae	*Cydon aethiopicus*	Star grass	X	X	X		X
59	Poaceae	*Digitaria scalarum*			X		X	
60	Poaceae	*Hyparrhenia rufa*	Thatch grass	X				
61	Poaceae	*Paspalum urvillei*	Vassey grass		X	X	X	
62	Poaceae	Bulbostylis humilis		X				X
63	Poaceae	*Heteropogon contortus*	Black spear grass	X	X			X
Total				**9**	**10**	**7**	**8**	**7**

Key: X-site species was identified

Other grass species that are generally available in the wider project region includes*: Digitaria abvssinica, Sporobolus spp, Hyparhenia spp, Fibristylis exiiis, Cynodon nlemfuensis, Cynodon doctvton, Lantana trifolia, Tarchonanthus camphorates, Panicum maximum, Grewia [allax, Striga asiatica, Sida ovata, Rubia cordifolia, Helinus integrifolius, Cussonia holstii, Psiadia punctulata, Vernonia lasiopus, Acalypha volkensii, Dissotis senegambieni, Hibiscus cannabinus, Hibiscus fuscus, Glycine wiqtiti', Pratea gaguedi, Lobelia fervens and 8erkheya spekeana.*

4.3.6.4 Shrub Species

Shrub species ranged from 8 in site MS 205 and 10 in sites MS 202, MS 203 and MS 204 where *Lantana trifolia, Lantana camara, Dodonaea viscosa* and *Leonotis nepetifolia* were the most prevalent species collected from all the study sites whereas *Psiadia punctulata, Senna didymobotrya, Gomphocarpus fruticosus* and *Elephantorrhiza burkei* occurred in one site each making them the least prevalent shrub species in the study area (Table 4-7).

Table 4-7: Dominant shrubs species collected in the proposed project sites

No	Family	Scientific Name	Common Name	MS 205	MS 204	MS 202	MS 201	MS 203
64	Verbenaceae	*Lantana trifolia*	Shrub verbana	X	X	X	X	X
65	Verbenaceae	*Lantana camara*	Lantana	X	X	X	X	X
66	Euphorbiaceae	*Ricinus communis*	Castor oil		X	X	X	

67	Fabaceae	Elephantorrhiza burkei	Elephant root			X		
68	Sapindaceae	Dodonaea viscosa	Hop bush	X	X	X	X	X
69	Apocynaceae	Gomphocarpus fruticosus	Narrrow leaved cotton bush		X			
70	Verbenaceae	*Lippia javanica*	Fever tea bush	X			X	X
71	Anacardiaceae	*Rhus natalensis*	Rhus		X	X		
72	Fabaceae	*Senna didymobotrya*	African Senna					X
73	Leguminoseae	*Crotalaria lachnocarpoides*	Crotalaria	X	X			X
74	Leguminoseae	*Crotalaria sagitallis*		X	X		X	
75	Lamiaceaea	*Leonotis nepetifolia*	Christmas candle stick	X	X	X	X	X
76	Sapindaceae	*Pappea capensis*	Jacket plum					
77	Solanaceae	*Withania somnifera*	Poison goose berry			X		
78	Amaranthaceae	*Chenopodium murale*	Neetle leaf goose foot	X		X	X	X
79	Fabaceae	*Eriosema jurionianum*	San pea				X	
80	Compositae	*Psiadia punctulata*	Psiadia			X		
81	Malvaceae	*Triumfetta rhomboidea*	Chinese bur		X		X	X
Total				**8**	**10**	**10**	**10**	**9**
Grand Totals				**50**	**52**	**49**	**46**	**42**

Key: X-site species was identified

In general, there was higher herbs, grasses and tree population in the natural habitats in each site and on the other hand, a higher density of herbs was recorded in the cultivated land.

A total of 81 plant species were collected from the five study sites where herbs consisted the highest population with 46% followed by shrubs at 22%, grasses 17% and the least population consisted of trees at 15%. Site MS 205 had a total of 50 plant species that were identified where, 54% were herbs, 18% grasses, 16% shrubs and 12% trees. In site 204, 52 plant species were collected of which 52% consisted of herbs, 19% each for grasses and shrubs, and 10% trees. Site MS 202 had a population of 49 plant species which consisted 51% herbs, 20% shrubs and 14% each for trees and grasses. A population of 46 species was collected from site MS 201 where 48% consisted of herbs, 22% shrubs, 17% grasses and 13% were trees. Site MS 203 had 42 plant species where herbs consisted the highest population with 45%, 21% shrubs whereas grasses and trees made up the least population percentage of 17%.

4.3.7 Dominant Animal Species Observed

There are few wild animal species in the proposed project area. This is because large parts of the area outside the caldera are farmlands, with residential settings. Bushes, which are protective to most wildlife, have been cleared. Nonetheless, Data collected on animal species in the five sites shows that there is a diversity on animal species in the study area. These included six animals, seven birds and four types of insects (Table 4-8).

Table 4-8: Dominant animal species observed within and around the proposed project site

Animals			
No	**Family**	**Scientific name**	**Common name**

1	Felidae	*Acinonyx jubatus*	Cheetah
2	Herpestidae	*Galerella sanguinea*	Slender mongoose
3	Procaviidae	*Dendrohyrax validus*	Tree hyrax
4	Leporidae	*Lepus europaeus*	Hare
5	Bovidae	*Madoqua kirkii*	Kirk's dik-dik
6	Bovidae	*Redunca arundinum*	Reed bucks
Birds			
No		**Scientific name**	**Common name**
7	Numididae	*Numida meleagris*	Guinea fowl
8	Columbidae	*Zenaida macroura*	Doves
9	Accipitridae	*Haliaeetus leucocephalus*	Eagles
10	Corvidae	*Corvus corax*	Crows
11	Ploceidae	*Ploceus sakalava*	Weaver birds
12	Bucerotidae	*Lophoceros bradfieldi*	Hornbill
13	Apodidae	*Apus horus*	Horus swift
Insects			
No		**Scientific name**	**Common name**
14	Apidae	*Apis mellifera*	Bees
15	Papilionoidea	*Rhopalocera*	Butterflies
16	Formicidae	*Formica rufa*	Ants
17	Termitidae	*Cryptotermes brevis*	Termites

Key: X-site species was identified

4.3.8 Endangered Species

In consultation with the Kenya Forestry Services, it was established that only ***Osyris lanceolate*** is the only endangered species in the region.

5 ANALYSIS OF PROJECT ALTERNATIVES

5.1 Overview

This section describes alternatives that were considered when developing the proposed project. The alternatives include different locations for laying the water pipelines, and other activities within the geothermal resource area. Each alternative would avoid at least one significant impact, but would include different or greater impacts of their own. Project alternatives, including a "Do Nothing" alternative, are described below.

5.2 Project Alternatives

5.2.1 The 'Do Nothing' Alternative

The "Do Nothing / No Action" alternative is often defined by the baseline information and is crucial in the assessment of impact because other alternatives are weighed with reference to it. Qualitative analysis indicates that there will be no significant negative effect on either the bio-physical or the socio-cultural environment of the proposed project. Without the project, we cannot say the environmental situation will either improve nor can we say that it will necessarily deteriorate.

The "No Action" Alternative is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The proponent will not benefit from the revenue expected from the facility
- The government kitty will not benefit from the revenue to be earned due to the establishment of the proposed project
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of electric power will not occur
- Information flow and public education awareness through electronic media, especially the television will be hampered
- The economic status of the Kenyans and the local people would remain unchanged
- The local skills would remain under utilized

5.2.2 'With Project' Alternative

The security of energy supply especially electricity generation in Kenya seems to be threatened by climate change induced phenomenon, chief among them, drought which negatively impacts other sources of power generation, notably hydro. Inadequate electricity generation capacity and high power bills have been perennial problems in Kenya prompting the Government to explore various ways of tackling the glitches.

A shift to alternative sources of energy such as geothermal power which is environmental friendly and more affordable to run compared to other sources of energy like fossil fuel will insulate the country against the effects of drought, which often interferes with hydroelectric power which historical has been the major source of installed power.

According to Vision 2030, it is estimated that the national power requirements in the next 17 years will reach 15000MW, which is about ten times the current 1700MW power generation capacity. This justifies the immediate need to more than double the power generation to 5000MW in the next 5 years to meet the rising demand and move in tandem with economic growth projections.

5.3 Technical Options

The Consultant conducted a review of the various technical options offered for the project. In close consultation with the client, the team settled on option B albeit with a few modifications (and therefore called it option D). Figure 5.1 shows the various options reviewed.

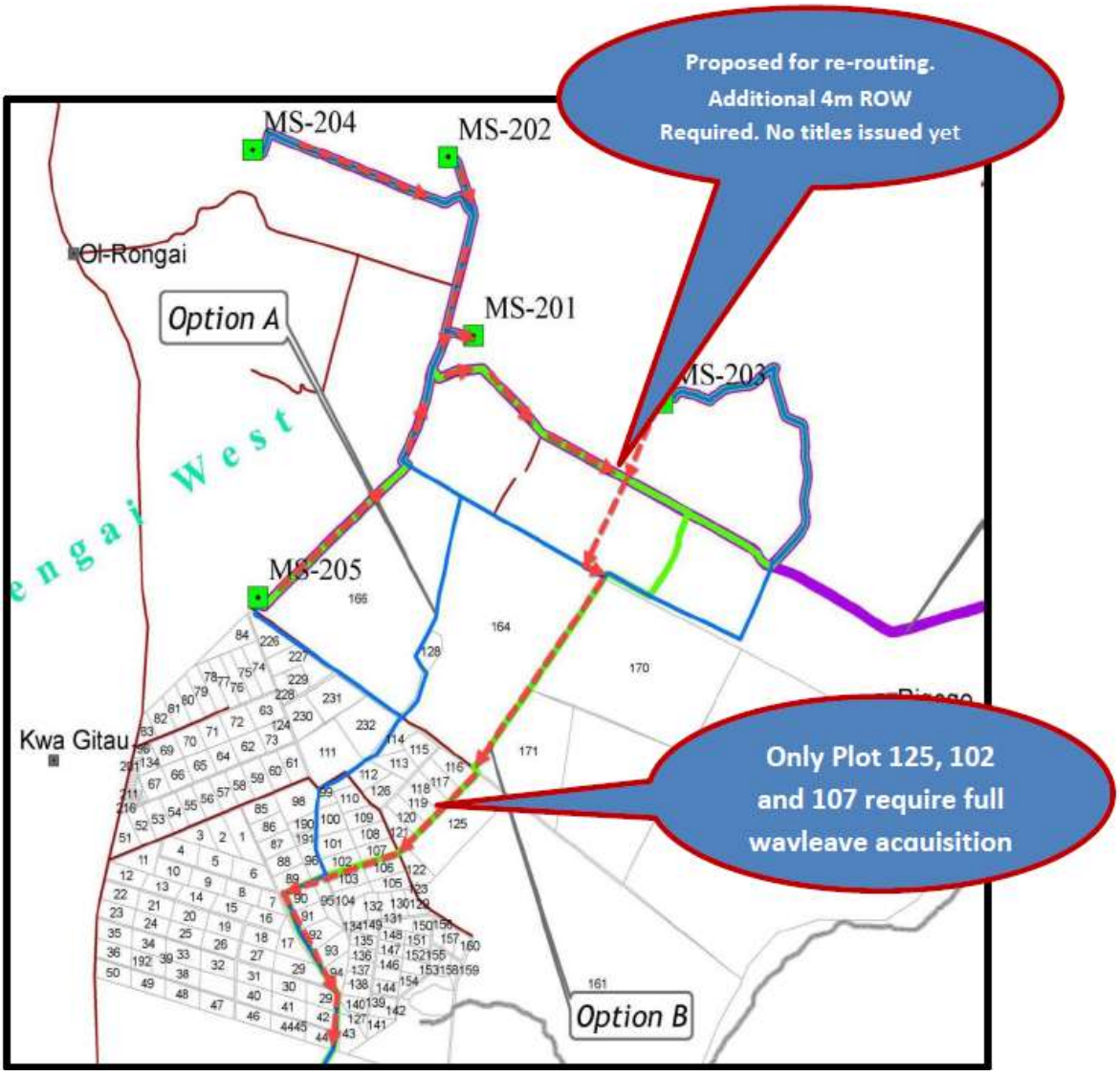

Figure 5-1: Technical options

The key reasons that led to choices made have been captured in Table 5.1:

Table 5-1: Project technical options

Proposed Route	Description	Remarks
Option A	The route in represented with color blue in Figure 5.1 below. It runs total length 21.4Km	This was previously the best option, as it was the most viable. However: • Certain sections of the line had very high elevations • The line would require displacement and compensations for more people compared to alternatives. To minimize the number of people that would be affected by the project, it was agreed to re-route a section of the line as shown.
Option B	The route is represented with green line in Figure 5.1. This route was 22km	This was the longest route. However, the proposed pipeline was majorly restricted to the existing road reserve, and therefore the project would affect the least number of people in this line. Most of its section was therefore adopted in the final proposed route.
Option C	The route is represented with purple line in Figure 5.1 This route is 18km	Even though this was the shortest route, its terrain was considered unconducive for the pipeline. Option C traverse sections that are hilly and rocky, factors that may not only significantly raise the cost of pipeline construction; they may also need heavy pumping when operationalised. The route is highly vegetated, and therefore pipeline construction would lead to clearing of many trees.
Option D (Proposed Route)	The route is represented with doted red line in Figure 5.1 below. The proposed pipeline will run a total of 19.3km	This route was modified from the hybrid of route A and route B. It has the following advantages: • It is the second shortest route. • It affects least number of people (PAPs). • The pipeline also has fewer bends thus less energy losses • It is mostly located on road reserves. • Fewest trees/vegetation would be affected • It provides the shortest interconnections to the proposed wells. • Proposed pipeline will run across the most conducive terrain

6 STAKEHOLDER ENGAGEMENT DURING PREPARATION OF THE ESIA

6.1 Introduction

Public consultation is not only one of the most effective means of encouraging and obtaining community input and feedback, it also serves to inform the community members and key stakeholders on the proposed projects. Several meetings *(Barazas)* were held around proposed project area and its environs to discuss the proposed project. Key stakeholders were also consulted. The aim of the consultation was to ensure that the views of stakeholders and the interests of the communities were identified and taken into account at the earliest during the ESIA study.

Local communities were mobilised with the help of the National, County and local administration. The *Barazas* brought together representatives from the larger community including women, youth and persons with disabilities.

This chapter summarizes the feedback on the consultations undertaken with other governmental and non-governmental organizations including the Kenya Wildlife Service (KWS), Kenya Forest Service (KFS), Nakuru County administration, Departments within the Ministry of Agriculture, Livestock, Fisheries & Irrigation, National Environment Management Authority (NEMA) and Farm managers.

6.2 Objectives of Public Consultation

The objective of the public consultation was to ensure that stakeholder and community interests were identified during the ESIA study and that stakeholder and community views taken into account.

The key objectives of such consultations were to.

- Inform the community members and key stakeholders on the proposed project activities.
- Receive community and key stakeholders' comments/ feedbacks/ questions about the proposed project.

Table 6-1: Meeting Venue and Scheduled Time for Public Consultation Meetings

Activity Day	Meeting Venue and Time Schedule of Public Consultation Meetings	Date of Meeting
1.	**Morning** • 10:30 am – 12: 00 noon **Ol' Rongai** **Afternoon** • 2:30 pm – 4:30 pm **Rigogo/ Marigo (Rigogo Center)**	Tuesday 30 October, 2018
2.	**Morning** • 10:30 am – 12: 00 noon **Kiamunyi** **Afternoon** • 2:30 pm – 4:30 pm **Valley Farm & Maciaro**	Wednesday 31 October, 2018
3.	**Morning** • 10:30 am – 12: 00 noon **Kampi ya Moto** **Afternoon** • 2:30 pm – 4:30 pm **Morop (GDC Material Laydown Yard/Land)**	Thursday 1 November, 2018
4.	**Morning** • 10:30 am – 2:00 pm **Ol Rongai**	Thursday 9 November, 2018

Table 6-2: Key Stakeholders consulted

SNo.	Name	Designation
1.	Dr. Erick Korir	Nakuru County Deputy Governor
2.	Joash Kiprotich	P.A. Deputy Governor - Nakuru County
3.	John B Kichwen	ACC 1 - Nakuru County
4.	Daisy Maina	Environment Officer (NEMA)
5.	Mrs. Grace Kirui	Nakuru County Director of Agriculture
6.	Fredrick O. Owino	County Crops Dev. Officer
7.	Joseph Kamau	County Animal Production Officer
8.	Patrick N. Kinyanjui	CADO
9.	Clare Obora	Administrator Youth & Sports
10.	J.M Kavita	Deputy County Commissioner Rongai
11.	Abdul G. Diba	ACC Kampi ya Moto
12.	Catherine Wambani	Senior Waden (KWS - Nakuru)
13.	Siman Kioko	Tourism Waden (KWS - Nakuru)
14.	Evelyne Silali	ART (KWS – Nakuru Research Assistant)
15.	Bernard Ngoruse	Ag. Regional Manager WRA
16.	James M Mwai	Field Officer WRA Nakuru
17.	Tabitha Ngatia	Field Officer WRA Nakuru
18.	Regina Githua	Field Officer WRA Nakuru

6.3 Common Issues from Public Participation

6.3.1 Knowledge of the Proposed Project and the relevant Power Agencies

From focus group discussions (FGD) and public consultations, it was observed that majority of the community members consulted were aware of the proposed Menengai West Geothermal Drilling Project as opposed to previous consultations held during the surface studies. The community members were also sensitised on the different agencies dealing in energy sector and their respective roles. These agencies include GDC, KENGEN, KETRACO, REA and KPLC.

6.3.2 Acceptance of the Project and Anticipated Benefits

During public consultation forums, even though some community raised concerns on the proposed project, majority of members of public expressed their support for the proposed project since they felt it would directly and indirectly benefit all the residents within the proposed project area. The people from Ol Rongai were delighted to have most of the proposed project activities based in their location. The same sentiments were echoed by people from Kampi ya Moto, Morop, Rigogo, Marigo, Valley Farm and Maciaro.

The community expressed their anticipated impacts related to the proposed project. Some of the positive impacts that the community expect include the following:

- **Creation of Employment Opportunities:** The communities living along the proposed project site were optimistic that the project will bring about short term and long term employment opportunities to the local communities during its implementation. They said that the contractor should consider employing the local communities during project implementation in activities like site clearance, excavation, driving and security services.

- **Increased Electrical Capacity and Reliability of Supply in Nakuru and Kenya at large:** The community expects that the Menengai West geothermal project is a great step forward towards achieving the goals of Vision 2030 with regards to enhancement of electrical capacity. They believe that if the exploration activity were successful, there would be adequate and stable power. They also believe that it would bring the cost of powered down.

- **Improved Road Infrastructure:** Due to the bad state of rural roads in the areas along the proposed well sites the local community members anticipate that the implementation of the project will result to improvement of roads in the project area, since the contractors would also need the road frequently to access the sites.

- **Increased Economic Activity in both the Project Areas and at the National Level:** During project implementation (civil works and well drilling and testing), the workers will demand goods and services that will be supplied by locals. The communities therefore believe that will provide business opportunities to locals.

- **Corporate Social Responsibility (CSR) Benefits:** The locals expect the proponent (GDC) to extend its social responsibility initiatives for the communities in the project area. Communities mentioned that they might benefit from provision and rehabilitation of water projects, improved roads, hospitals/ dispensaries or schools.

- **Benefits of Engagement by Both Genders:** The proponent encourages involvement of both women and men in realisation of the proposed project. Local employment opportunities that will be available during the construction phase would provide both direct and indirect income for both women through small scale business activities

- **Enhancement of the Socio-cultural and Local Leadership Structures:** It was suggested that the proponent (GDC) should empower and utilise the local leaders, extensively consult with them in every undertaking. This will act both ways in ensuring the project runs smoothly and at the same the proponent would be reinforcing the authority of the chiefs as the community observes how they have been involved.

- **Increased Access to Electricity:** The local communities were optimistic that if the exploration is fruitful, those with no electricity in remote areas will be connected to power for domestic use once the projects are complete. Most of the resident along the proposed project area were now optimistic for connection since most of them had not been connected due high installation cost escalated by the scattered nature of settlement in the area. However, it was explained that connection to electricity for domestic purpose will be done via the distribution lines (KPLC and REA) but not directly from any geothermal plant. However, availability of more power to the grid seems promising to the locals.

6.3.3 Envisaged Project Negative Impacts and Proposed Mitigation Measures

The consultant and the community also discussed possible negative impacts from the project. The following were the negative impacts anticipated based on the discussions that were held with the local communities:

- Loss of lands
- Relocation/ displacements (Loss of structures along the well sites and water pipe way leave and change in land use)
- Fear that the project lies in a settlement area and is too close to residences and individual farms and this will affect the owners
- Loss of vegetation and animal folder
- Reduction of grazing land
- Livestock accidents
- Dust emission during construction
- Health problems as result of dust and emissions
- Soil erosion.
- Surface and ground water pollution
- HIV/AIDS as a result of population influx
- Noise pollution during construction

During the public meetings, the community members proposed the following mitigation measures to mitigate the above impacts.

- That GDC must properly consult and compensate all the affected individual before commencement of the project. They must then be given adequate time to relocate.
- Control vehicle speeds (erect speed bumps) and employing security guards to man the excavated areas in order to avoid animal accidents
- Construction of necessary structures to control soil erosion
- Avoiding pollution of water resources during construction
- Sprinkling of water to combat dust emission
- Provision of medical services to those who suffer from illnesses as a result of dust and emissions from the construction machines.
- Install sound proofing's, and ensuring proper maintenance of machines to minimize noise pollution during construction
- Community sensitization and provision of condoms to workers to prevent spread of HIV/AIDS
- Compensation for land affected, trees cut and structures that will be demolished
- All the aquifers should be sealed off during drilling to avoid any contamination of the upper aquifers
- The hydrogen sulfide should be monitored to ensure that it will not impact negatively to the residence of the area

6.3.4 Anticipated challenges during project implementation

The members of public mentioned the following as being the challenges that the proposed project may be faced with during implementation:

- Poor road network
- Issues of employement for the locals if not properly guided by a framework
- Inadequate skilled manpower
- Insecurity (vandalism, breakages and theft of construction materials)
- Challenges during acquisition of land

6.3.5 Literacy Level

From the discussions with the key stakeholders such as county commissioners, assistant county commissioners and the area chiefs it was noted that literacy levels among members of the local communities was high. Majority 67% of the respondents interviewed had attended high school education.

6.3.6 Community Social Responsibility (CSR) Activities

The local communities within the project area expects that the project proponent shall consider supporting community projects as part of their corporate social responsibility. The priority community projects included upgrading school infrastructure, building dispensaries, supplying roof tops to local schools and dispensaries, sinking water well and drilling boreholes to increase access to water which is a major concern in some areas such as Maciaro, Valley, Ol' Rongai, Kampi ya Moto in Rongai sub-county. It was however recommended that the communities should be consulted by the project proponent to give their priority issues of concern. According to the local residents, priority areas that may need quick interventions on CSR activities include;

- Water
- Road Rehabilitation and
- Upgrading and improvement of local dispensaries/ hospitals

The pictures below shows some of public barazas held with the local communities

Figure 6-1: Representative addressing a public baraza in Ol' Rongai

Figure 6-2: Public consultation in Rigogo Center

Figure 6-3: Valley & Maciaro public baraza

Figure 6-4: Kampi ya Moto public baraza

Figure 6-5: Morop (GDC Kabarak) public baraza

Figure 6-6: Kiamunyi public baraza

6.4 Key Issues from Key Stakeholder Consultation

Key informant interviews was conducted with various stakeholders/ informants. All the key stakeholders consulted were optimistic that the proposed project would boost power supply and spur industrial development in Nakuru country.

6.4.1 Nakuru County Deputy Governor

The County Commissioner, Nakuru County, was informed on the proposed project. He welcomed the project and promised full support to the last stage. He advised that the consultant and the proponent should involve the environmental team in the county. He also pointed out that the county was focused on implementation of the Big Four agenda through which the project would link to. According to the deputy governor, the office had received some complaints from the Olkaria projects in Naivasha and was hoping that the Menengai West Geothermal drilling project would pick up from these experiences. "I am sure the process will be smooth," assured the deputy governor. The deputy governor voiced his support for the proposed project and suggested that his office be included in future consultative forums after the study.

6.4.2 Assistant County Commissioner 1 – Nakuru County

After a briefing of the proposed project from the consultant, the Nakuru County ACC 1 gave assurance of support from his office. He further emphasised on the need of sensitising the public through consultations and the issues of compensation. The consultant assured him that this was part of the process consultations were already on-going.

6.4.3 Environment Officers - National Environment Management Authority (NEMA)

The officers welcomed the project to the county. The presence of Menengai Forest and possible impacts on vegetation cover around the project area were the main issues of concern by the environmental officers. There had been some issues regarding noise of vibrations reported in previous incidences from on-going projects within the area due to mechanical issues. The officers emphasised on the need to ensure that proper mitigation measures are taken against noise from vibrations, possible effluent gases that may be emitted from the project and issues of oil spillage be taken into consideration.

6.4.4 Nakuru County Director of Agriculture

According to the County Director of Agriculture (CDA) – Nakuru County, the major common crops grown within the project area include; Maize, Beans and Wheat. Moreover, vegetables, citrus, mangoes and bananas are found within the project area but in small quantities. There also exists presence of fodder crops and pastures. Activities from the geothermal project are likely to affect the size of grazing areas. It was also noted that the area in dominated by large scale farmers majority practising mixed farming.

The possible negatives impacts due to the Menengai West project proposed activities would be loss of income (livelihood) due to displacement. Proper mitigation mechanisms need to be put in place to ensure a smooth process. On issues of compensation, the DCA stated that a committee from the ministry had been working on a framework for crop compensation due to a recent project by KETRACO on way leave acquisition. Another possible effect of the project would be the effects of H_2S emissions on crops P^H if the concentrations were not permissible. The director pointed out on the need to have frequent tests on H_2S concentrations to ensure that gasses emitted are at the requisite standards. She later added that the coming of the project would bring along employment to the locals (both skilled and unskilled) as this would be a positive impact from the project.

6.4.5 Nakuru County Animal Production Officer

The Nakuru County Animal Production Officer (CAPO) said that the common livestock found within the project area include beef, dairy, pigs, bees, poultry (all types), sheep, goats, donkeys, duck, turkey and guinea fowls. He added that the likely impacts of the project that needed to be considered during project implementation included loss of income from meat production due to reduction in size of grazing land. If the project would result in complete relocation/displacement, there would be possibilities shock and diseases due to relocation. This would lead to reduction in milk production and the most affected animals would be those in zero grazing. The Menengai West project location is highly potential in milk, beef, goats and sheep production. The area is also favourable to commercial pasture (grass and hay). The issues of sulphur on pasture needs not to be overlooked since the officer had received reported cases of farmers adding lime to balance the P^H from purported incidences resulting from on-going similar activities in the area.

The officer was hoping that there would not be need of relocating the whole milking unit since the structures are usually permanent and the spill effects of relocating such structures would be very significant.

In his final remarks, the officer suggested that issues of compensation should not only focus on the present but long term effects on income of the future. On CSR activities, the proponent should also borrow experiences from other projects like the Nyandarua Wind Project where the locals benefited from development of a market structure for their produce. He gave suggestions of putting up a cooling plant for milk production.

6.4.6 Deputy County Commissioner - Rongai

The Deputy County Commissioner (DCC) of Rongai welcomed the consultants to Rongai. After a brief of the proposed project within Menengai West location by the consultants, the DCC was not hesitant to echo the need of power (electricity) to the people of Rongai. "Just like River Nile scenario, it is not fair to have power generated from Rongai and the locals don't have it," remarked the DCC. Rongai sub-county needs proper health care facilities, schools, roads and employment. The constitution is clear on the percentage (about 70%) of the locals getting employed in areas that don't need a lot of expertise (unskilled labour). "We hope that GDC will ensure this is taken into consideration in this new proposed project", said the DCC.

The commissioner was also concern about the alleged reported long term effects of sulphur by residents on Rongai from similar project activities. He proposed that GDC put up a health facility as part of her CSR activities and also sink water boreholes for the locals. Apart from water and hospital facilities, the other major areas the proponent could engage in as part of CSR activities included;

- Construction and upgrading of existing roads and
- Rehabilitation of existing schools (roof tops, number of class rooms among other activities)

He also added that the proponent should also benchmark with other project currently put up in the county i.e. the Standard Gauge Railway Project which sank water boreholes and provided employment to the locals.

According to the DCC, the area is primarily dominated by very enlightened and senior people in the government including the retired Kenyan President (Daniel Toroitich Arap Moi), a list of top government officials, retired lawyers and members of the Kenya Defence forces. Menengai West is also a cosmopolitan region dominated by communities from a wide spectrum. He also agreed that any project comes with its challenges and hoped that the consultants would win the hearts of the locals by telling them the truth and the possible positive and negative effects related to the project.

Finally, the DCC confirmed full support of the project and promised to help the consultants if need arose in during their ESIA study.

The pictures below show some consultations meetings that were held with the key stakeholders within the project area.

Figure 6-7: *Consultation at the* Nakuru *Deputy Governors' Office*

Figure 6-8: Consultation *with ACC 1 Nakuru County*

Figure 6-9: Group photo from consultation meeting with the Key Stakeholders from the Departments within the Ministry of Agriculture, Livestock, Fisheries & Irrigation – Nakuru County

Figure 6-10: Consultation with the Deputy County Commissioner – Rongai Sub-County

Figure 6-11: Consultation with KWS Officers – Nakuru County

Figure 6-12: Consultation with Ol Rongai Chief and his assistants

7 POTENTIAL ENVIRONMENTAL AND SOCIAL RISK AND IMPACTS

7.1 Approach to Impact Analysis

The IFC Performance Standards PS) on Environmental and Social Sustainability states that the environmental and social risks and impacts section should take into account all relevant environmental and social risks and impacts of the proposed project, including the environmental and social risks and impacts, specifically identified in PS 2 to PS 8, as well as any other environmental and social risks and impacts arising from the specific nature and context of the proposed project.

The primary purpose of an ESIA is to predict the impacts resulting from a project and identify measures to avoid, reduce, or compensate for adverse impacts. Impacts can be direct, indirect, or induced, as defined in the Table 7-1 below.

Table 7-1: Types of Impacts

Impact	Description
• **Direct**	Impacts that result from a direct interaction between the proposed project and a resource/receptor (e.g., between disturbance of a plot of land and the habitats on that plot of land that are affected).
• **Indirect**	Impacts that follow from the direct interactions between the proposed project and its environment as a result of subsequent interactions within the environment (e.g., impacts on bird population levels as a result of construction noise impacts on bird breeding behaviour).
• **Induced**	Impacts that result from other activities (which are not part of the proposed project) that happen because of the proposed project (e.g., increased spending in the local economy due to increased worker employment).

7.1.1 Step 1: Predict Impacts

Potential project impacts are predicted and quantified to the extent possible. The magnitude of impacts on resources (e.g., water and air) or receptors (e.g., people, communities, wildlife species, habitats) is defined. Magnitude is a function of the following impact characteristics:

- Type of impact (i.e., direct, indirect, induced)
- Size, scale, or intensity of impact
- Nature of the change compared to baseline conditions (i.e., what is affected and how)
- Geographical extent and distribution (e.g., local, regional, international)
- Duration and/or frequency (e.g., temporary, short-term, long-term, permanent)

Magnitude describes the actual change that is predicted to occur in the resource or receptor. The magnitude of an impact takes into account all the various impact characteristics in order to determine whether an impact is negligible or significant. Some impacts can result in changes to the environment that may be immeasurable, undetectable, or within the range of normal natural variation. Such changes can be regarded as essentially having no impact, and are characterized as having a negligible magnitude. In determining the magnitude of impacts on resources and receptors, embedded controls

(i.e., physical or procedural controls that are incorporated into the proposed project) are taken into consideration. For example, the magnitude of impacts on stream water quality from ground disturbance take into consideration the effectiveness of proposed sediment and erosion control measures that would be applied during construction.

In addition to characterizing the magnitude of impact, the sensitivity of the impacted resource or receptor is characterized by its sensitivity to change, vulnerability, importance, and quality, as applicable. Resource sensitivity includes local, national, and international scale considerations, such as abundance or scarcity of a physical resource, as well as sensitivity to the specific project activities that are proposed. Human receptor vulnerability is also considered. Resource and receptor sensitivity are designated as low, medium, or high.

7.1.2 Step 2: Evaluate Impacts

The significance of a potential project impact is evaluated by considering the magnitude of the impact in combination with the sensitivity/vulnerability/importance of the impacted resource or receptor. The assignment of a significance rating facilitates decision-makers and stakeholders to understand how much weight should be given to the issue in their process. In the case of beneficial impacts, the significance is assigned as positive or beneficial.

Significance was assigned for each impact using the matrix shown in the table. This matrix applies universally to all resources or receptors.

Table 7-2: Risk and Impact Significance Matrix

Risk and Impact/ Magnitude	Resource or Receptor Sensitivity[5]			
	Very Low	Low	Moderate	High
Very Low	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact
Low	Negligible Impact	Negligible Impact	Less than Significant Impact	Potentially Significant Impact
Moderate	Negligible Impact	Less than Significant Impact	Potentially Significant Impact	Significant Impact
High	Less than Significant Impact	Potentially Significant Impact	Significant Impact	Significant Impact

The levels of impacts are defined using the following terms:

- **Negligible Impact.** A negligible impact is one where a resource or receptor (including people) would not be affected by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.
- **Less than Significant Impact.** A less than significant impact is a minor impact is where a resource or receptor would experience a noticeable effect, but the impact magnitude is sufficiently low (with or without mitigation) and/or the resource or receptor is of low sensitivity.

[5] *Resource or receptor sensitivity collectively refers to characteristics including sensitivity to change, vulnerability, importance, and quality, as applicable*

In either case, a less than significant impact must be sufficiently below applicable standard threshold limits.

- **Potentially Significant Impact.** A potentially significant impact is a moderate impact that meets applicable standards but comes near the threshold limit. The emphasis for such moderate impacts is to demonstrate that the impact has been reduced to a level that is as minor as reasonably practicable so that the impact does not exceed standard threshold limits and become significant.

- **Significant Impact.** A significant impact is one where an applicable standard threshold limit would or could be exceeded, or if a highly valued or very scarce resource would be substantially affected.

In addition to the risks and adverse effects, the proposed project may include positive effects. Some of the positive effects from the proposed project are described in the impact evaluation, such as the potential for generating temporary jobs during exploration activities; however, the impact evaluation primarily focuses on the adverse impacts.

7.1.3 Step 3: Evaluate Mitigation

After predicting and evaluating the impacts, the ESIA process involves evaluating mitigation measures that could be implemented to avoid, reduce, or compensate for the impacts, as necessary and to the extent reasonably feasible. A mitigation hierarchy from the World Bank Environmental and Social Framework was used in which preference is always given to avoid or minimize the impact before considering other types of mitigation (i.e., observe, remedy, compensate, offset). The hierarchy of mitigation measures includes:

1. **Anticipate and Avoid Impacts.** Remove the source of the impact (i.e., avoid the specific action or resource area).

2. **Minimize Impacts.** Reduce the magnitude of the impact, where the impact cannot be completely avoided.

3. **Compensate or Offset Impacts.** Where significant residual impacts would remain after exhausting avoidance and minimization options, provide compensation or offsets for the impact, where technically and financially feasible.

7.1.4 Step 4: Evaluate Residual Impacts

Residual impacts are the impacts that are predicted to remain after mitigation has been implemented based on the effective outcomes. The significance of residual impacts are rated in the same way as impacts before mitigation (e.g., less than significant, potentially significant, and significant), but includes assumptions on how mitigation would reduce the impact magnitude or otherwise address sensitivity characteristics, thereby reducing its overall significance.

7.2 ENVIRONMENTAL RISKS AND IMPACTS

7.2.1 Water Resources

No surface water resources (e.g. Streams, dams, or water pans) were observed within or near the proposed project sites. According to the household survey of people living around the proposed project sites, majority of respondents (52%) residing within the two sub counties have access to piped water, which originates tens of kilometers from the proposed project site. Nonetheless, exploration exercise should be conducted in such manner that protects all surface water contamination (even those far beyond the proposed project sites can be affected though through run-offs).

Potential Risks/Impacts and Magnitude

a) Water Quality

Civil Works: The proposed project would involve construction of new access road segments, expansion of existing access roads, and construction of well pads. Grading and vegetation clearing activities during the civil works phase of the proposed project could destabilize soil and result in erosion or sedimentation during rain events. Erosion and sedimentation that reaches the drainage network has the potential to degrade surface water quality.

Well Drilling *and Testing:* Geothermal fluid could be produced during the geothermal drilling and testing at the proposed sites. Drill cuttings and fluids produced during drilling, and produced geothermal fluids could contain high levels of the following heavy metals, which commonly occur in geothermal resources:

i. *Arsenic*
ii. *Boron*
iii. *Cadmium*
iv. *Chromium*
v. *Nickel*
vi. *Mercury*
vii. *Zinc*
viii. *Uranium*
ix. *Radium*
x. *Gross alpha and beta*

Drilling waste and any geothermal fluids would be collected in tanks or reserve pits at the drilling sites. Fluids would be allowed to evaporate or, or they would be reinjected into the well.

If the reserve pits were improperly constructed or maintained, fluids in the pits could be flow into the drainage network, which could degrade water quality downstream from the drilling areas. Incidental leaks or spills of hazardous materials could also contaminate nearby waterways if the materials are not properly contained.

There is a risk that the geothermal drilling and testing operations could result in a release of geothermal fluids to surface waters. While unlikely, a well blowout could result in an uncontained discharge of geothermal fluids that could flow to surface water.

Well blowouts are typically caused by improper well construction or lack of blowout prevention (BOP) equipment. Well BOP equipment will be installed on all wells.

Civil Works and Well Drilling: Earth moving equipment (e.g., graders and dozers) and drill rigs require the use of oil, grease, hydraulic fluids, and other chemicals. Leaking construction equipment, drill rigs, or improperly stored hazardous materials could result in a discharge of hazardous materials to nearby water bodies during rain events. The transport of hazardous materials to waterways has the potential to degrade water quality downstream of the work area.

Surface pollution upgradient of springs or well drilling within connected aquifers could impact ground water quality. These springs are likely surface manifestations of ground water collection from upslope area, and the potential drilling areas are located downgradient from the springs; however, the potential for underground connectivity between spring sources and aquifers that may be encountered during drilling cannot be known without further study or monitoring.

Reclamation: Reclamation would involve earth-moving activities that would have a potential to cause erosion prior to vegetation establishment. The equipment used during reclamation would also require small quantities of hazardous materials (e.g., oil, grease, and hydraulic fluid).

b) Water Supply

Civil Works: Construction equipment and grading could directly damage water supply systems (i.e., pipes connected to individual homes) that are buried. In particular, the buried pipelines and water supply infrastructure next to MS 205 could be damaged during well pad and access road construction. Effects to the water supply system would have an adverse effect on water supply in the community if not promptly repaired**.**

Water would be required for dust control during road and well pad construction. Since GDC would have its independent water source from that of the community, water supply impact would be minimal. In addition, the volume of water required for dust control would be minimal and would not noticeably affect the availability of water in the region.

Well Drilling: The proposed project would require fresh water for drilling, worker needs (e.g., drinking, washing, and sanitation), and dust control. Drilling water pipeline has been proposed.

The volume of water required during well drilling would vary depending on the type of well (e.g., slim-hole or full-sized well) and the subsurface conditions and rock/fracture permeability, which are currently unknown. Higher permeability rocks with numerous open fractures would require more water during drilling. The water supply lines are specified in ***Section 2.5***.

Installation of a water well in the proposed project areas would not affect the water supply in the area because there are no existing uses of groundwater resources in the area.

Reclamation: Water use would be limited during reclamation and would be used primarily for dust control.

c) Flooding

Civil Works and Well Drilling: None of the proposed project sites is located within a flood plain, or flood prone areas. However, the minimal surface recontouring to construct a well pad would not measurably effect runoff in any of the effected drainages. The well pads are relatively small in size and would remain largely pervious so that they would not concentrate downstream flow or cause any increase in downstream flooding.

Reclamation: At decommissioning phase, the proposed project site would be returned to its pre-existing contours and vegetation types during site reclamation. Reclamation of the site would have no impact on flood intensity off site.

Impact Significance and Mitigation

The significance of each impact on water resources and mitigation measures that would be applied are summarized the table below:

Table 7-3:* Summary *of Potential Water Resource Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre- Mitigation Significance	Mitigation Measure	Residual Significance
Water Quality	Sediment Discharge	High	Moderate	**Significant**	Water-1 Water-2	Negligible to Less than Significant
	Drilling Waste	High	Moderate	**Significant**	Water-3	Negligible
	Geothermal Fluid Discharge	High	High	**Significant**	Water-4	Negligible to Less than Significant
	Hazardous Material Discharge	High	Moderate	**Significant**	Hazards-1	Negligible
	Underground Contamination	High	Moderate	**Significant**	Water-2	Negligible
Water Supply	Damage Water Supply Infrastructure	High	Moderate	**Significant**	Water-5	Negligible
	Water Use (Dust Control)	High	Very Low	Negligible	Water-5	Less than Significant
	Water Use (Well Drilling)	High	High	**Significant**	Water-6	
	Groundwater Well	Low	Low	Less than Significant		
Flooding	Well Pad Construction	Moderate	Low	Negligible		

7.2.2 Air Quality

Sensitive Receptors

Some residential dwellings are located in proximity to the drilling areas, especially MS 205, 204, 203, and 202. These dwellings are considered sensitive receptors. Over 10% of the residents in the proposed project area are over 60 years (and therefore considered elderly individuals). These are people who may be more sensitive to air quality from the drilling sites.

Potential Risks/Impacts and Magnitude

a) Equipment Emissions and Fugitive Dust

Civil Works and Well Drilling: Well pad construction for slim wells would require leveling and compaction to create a stable surface for the truck mounted drill rig. The full-size wells could require soil excavation, grading, and vegetation removal, which could create sources of fugitive dust. Travel over unpaved access roads during civil works and well drilling operations could create fugitive dust, which could impact air quality and visibility. Access road improvements may require vegetation removal and grading with heavy equipment which could also produce fugitive dust. Fugitive dust could settle onto adjacent agricultural products or could cause visible dust plumes that would be noticeable to people living or working in the area.

Both the civil works and well drilling construction phases would require the use of heavy diesel-powered equipment. The equipment exhaust would result in emissions that would temporarily degrade air quality in the immediate vicinity of the equipment. Equipment emissions would dissipate rapidly in the atmosphere and would not result in a substantial increase in any air pollutant at sensitive receptors.

Reclamation: The air quality effects of reclamation would be similar to those of civil works but likely short induration (less than one week) during site re-contouring. Reclamation activities would stabilize the site to avoid long-term emissions of fugitive dust.

b) Geothermal Gas Emissions

Well Drilling and Testing: Well drilling and flow testing could result in the release of geothermal steam if the resource is encountered. The geothermal emissions may include water vapor, carbon dioxide, and ***hydrogen sulphide*** (H_2S). Small amounts of ***boron***, ***arsenic***, ***mercury***, and ***bicarbonate*** may be entrained in geothermal steam and emitted during drilling and testing. These gases occur naturally at the surface manifestations of the geothermal resource at Sulphur Springs.

Well flow testing would only occur if the geothermal resource was encountered, and would not occur at the site to minimize risks to the population due to proximity to

sensitive receptors. Flow testing would involve venting steam to the atmosphere and could emit H_2S, boron, arsenic, mercury, and bicarbonate. The geothermal resource is usually encountered at the latter phase of drilling—the last 10 to 15 days. H_2S is the constituent of primary concern in geothermal emissions because it can cause health effects at elevated levels. The H_2S concentration measured at Sulphur Springs is characteristic of the anticipated H_2S concentrations anticipated during venting of the geothermal resource. Local receptors within 100 meters (328 feet) may smell a "rotten egg" odor if H_2S is present in the steam.

It is not feasible at this stage of the proposed project to conduct air dispersion modelling to predict H2S levels at receptors because (1) the precise location of the well pads and relative distance to receptors is not defined, (2) the chemistry of the geothermal resource in the potential drilling areas is not known, and (3) there is no data on the wind speed and direction in the proposed project areas. Any emissions from the geothermal drilling and testing, including a potential blowout, would disperse quickly in the atmosphere. The air quality risk from geothermal testing would be moderate due to quick dispersion rates, the short duration of drilling and testing activities, and limited volume of fluid that could be produced. The proponent will ensure that the temporary venting of geothermal steam during resource testing would not cause any adverse health effects and is not expected to exceed WHO H_2S thresholds for eye irritation.

Impact Significance and Mitigation

The significance of each impact on air quality resources and mitigation measures that would be applied are summarized in the table below:

Table 7-4: Air Quality impacts

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significan
	Fugitive Dust	Moderate	Low	**Less than Significant**	Air-1	Negligible
Residences	Equipment	High	Low	**Potentially**	Air-2	Negligible
Community members	Geothermal Gas Emissions	High	Moderate	**Significant**	Air-3	Negligible to Less than Significant

7.2.3 Geology and Soils

Sensitive Resources

The potential drilling areas in all the sites (i.e. MS 201 to MS 205) are based in active agricultural uses (crops and/or livestock). Productive topsoil is important to agricultural production and topsoil is considered a highly sensitive resource to the community. MS 205 and MS 202 and the access roads to the drilling sites are located within areas that are prone to erosion due to the sloppy terrain. The risk of landslides is also relatively high in MS 205 due to steep slope and due to the derelict lands after quarry activities, especially where access road grading may be required.

Figure 7-1: Small scale quarry within proposed site (MS 205)

Figure 7-2: Derelict quarry land (MS 205) susceptible to landslide

Figure 7-3: Active quarry land just outside the proposed site (MS 202)

Potential Risks/Impacts and Magnitude

a) Erosion and Topsoil Loss

Civil Works: Access road and well pad grading and vegetation clearing activities could cause soil erosion and loss of topsoil. Gravel would be installed at work areas and access roads, where necessary, to facilitate all weather access for vehicles and equipment. Substantial erosion could affect slope stability and lead to sediment transport. Substantial topsoil loss could affect agricultural land and crop production.

Well Drilling and Testing: Well drilling and testing activities would be conducted within the stabilized well pad. Well drilling and testing activities would not disturb nearby areas or cause loss of topsoil. Geothermal fluid spills from the sump (if used) could cause erosion of topsoil in steep areas. Most well pads would be located on relatively flat areas, reducing the risk of runoff and erosion.

Reclamation: Reclamation would involve re-contouring of the site to pre-existing conditions. The removal of gravel could temporarily destabilize the soil and cause soil erosion; however, the reclamation activities would provide long-term stabilization of the site and involve replacement of topsoil to minimize or avoid effects from topsoil loss.

b) Landslides, Mudflows, and Unstable Soil Conditions

Civil Works: The access roads leading to the potential drilling areas require passage through steep terrain with tight turns. Access roads may need to be expanded in areas where the turning radius is insufficient to accommodate large construction equipment. Expansion of the access road along steep slopes could cause slope instability if the road expansion is not properly designed to address soil and slope conditions.

The potential drilling areas are located in an areas known to contain saturated soils. Construction of the well pad and access road could create an unstable work area if the well pad was not properly engineered and constructed to address saturated soil conditions.

Well Drilling: The slopes surrounding the MS 205 and MS 202 areas are sloppy, therefore potential to mudflows. Landslides could affect the drilling sites depending on the location and extent of slope failure. Due to the short duration of drilling activities, drilling activities should be timed to avoid periods when there is a risk of substantial rainfall and landslide or mudflow.

Reclamation: Reclamation would return the sites to the pre-construction conditions and would not increase the potential effects related to landslides, mudflows, and unstable soil conditions.

c) Seismicity

Well Drilling and Testing: There is no causal link between exploratory geothermal drilling and induced seismicity. The exploration-drilling program would not exert pressure on a known fault system or induce seismicity.

Reclamation: Reclamation activities would have no effect on seismicity.

Impact Significance and Mitigation

The significance of each impact on geology and soil resources and mitigation measures that would be applied are summarized in the table below:

Table 7-5: Summary of Geology and Soil Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Topsoil	Erosion (Civil Works)	High	Moderate	Significant	Water-1 Soils-1	Negligible to Less than significant
	Erosion (Well Drilling)	High	Very Low	Negligible	--	--

Slope/ Soil	Destabilization Slopes/ Soil (Civil Works)	High	High	Significant	Soils-2	Negligible to Less than Significant
	Destabilization Saturated Soils	High	Moderate	Significant	Soils-2	Negligible
Stability	Destabilization Slopes/Soil (Well Drilling)	High	Low	Less than Significant	--	--
	Induced Seismicity (Well Drilling)	Moderate	--	Negligible	--	--

7.2.4 Noise

Sensitive Receptors

Noise sensitive land uses can include residential areas, schools, and places of worship. No schools or places of worship are located in proximity to the drilling areas. Residences are located in the vicinity of four of the potential drilling areas.

Residents are typically most sensitive to noise at night, when noise can interfere with sleep. The noise sensitivity for receptors in proximity to the drilling sites is considered high because the proposed project could involve drilling and testing activities at night.

Potential Risks/Impacts and Magnitude

Civil Works: The proposed project would temporarily generate noise during construction activities from the operation of motorized vehicles (e.g., trucks and bulldozers) and stationary equipment (e.g., generators, compressors, pumps, etc.). Civil works activities would occur during daytime hours. Typical noise levels from civil works activities are listed in section 3.5.4.

The noise levels in (*Table 3-5: Occupational Noise Exposure Limits and Required Hearing Protection)* are based on a reference distance of approximately 15 meters (50 feet), and the noise level would change with distance. Noise levels attenuate (decrease) at an average rate of approximately 6 dBA per doubling of distance from a source. Conversely, noise levels increase by approximately 6 dBA when distance is reduced by half. For example, if noise from a bulldozer is 85 dBA at a distance of 15 meters (50 feet), the adjusted noise level would be 79 dBA at 30 meters (100 feet) and 91 dBA at 7.5 meters (25 feet).

Table 7-6: Typical Noise from the Proposed Activities[6]

Activity	Predicted Noise Levels (dBA) at Distance								
Meters	3.8	7.6	15.2	30.5	61.0	152.4	304.8	609.6	1,524.0
(Feet)	(13)	(25)	(50)	(100)	(200)	(500)	(1,000)	(2,000)	(5,000)
Civil Works	96	90	84	78	72	66	60	54	48
Well Drilling (Large Rig)	93	87	81	75	69	63	57	51	45
Well Drilling (Small Rig)	83	77	71	65	59	53	47	41	35
Well Clean-Out	93	87	81	75	69	63	57	51	45

[6] *Estimated noise levels are given for various distances from the noise-generating sources. These noise levels do not account for the topographical barriers, trees, vegetation, and manmade structures through the project area that would absorb or deflect sound waves, thereby reducing noise levels.*

Well Flow-Testing	96	90	84	78	72	66	60	54	48

Sources: (U.S. Department of Interior, Bureau of Land Managment 1995)

Well Drilling: The proposed project drilling areas are generally located in areas that are characterized as residential, rural residential and mixed-use agricultural land. The World Bank's guidelines for noise in residential areas, when measured at the nearest sensitive receptor, are as follows:

- ≤ 55 dBA during daytime hours (7:00 and 22:00)
- ≤ 45 dBA during nighttime hours (22:00 and 7:00)
- ≤ 3 dBA increase above existing ambient levels (all periods)

The World Bank's guidelines are generally suited for permanent noise increases, such as noise from permanent facility or frequent operation activity. Infrequent and temporary construction noise typically exceeds these guidelines; however, the guidelines can indicate a potential noise impact for construction noise that is relatively long-term (more than a few weeks or months).

Residences (sensitive receptors) are located in proximity to the boundary of potential drilling areas, especially at MS 205, MS 201 and MS 204. Construction activities at 15 meters (50 feet) from the proposed project would temporarily exceed the World Bank's guidelines for permanent noise. Temporarily exceeding the guidelines would not be a significant impact on its own; however, the proposed project could generate substantial temporary noise that could impact adjacent residents and workers, depending on the noise characteristics (i.e., overall level, difference between existing ambient noise, duration, frequency, and timing), receptor location (i.e., separation distance and intervening vegetation, topography, and structures), and receptor sensitivity.

Daytime drilling noise could result in adverse community reaction if a well is drilled adjacent to the three mentioned areas. Most other drilling areas would allow 50 meters (160 feet) or more buffer from residences.

Night-time drilling noise could cause adverse community reaction and potentially sleep disturbance. Noise above 45 dBA during night-time hours is likely to cause sleep disturbance. Noise levels could exceed 45 dBA up to 300 meters (1,000 feet) from the well pad. Indoor noise levels with the windows closed would be attenuated and less than outdoor noise levels. Procedures should be implemented to position well pads as far from receptors as feasible, and to reduce equipment noise levels to the greatest extent possible.

Drilling may also cause periodic vibration that could be felt up to approximately 10 meters (30 feet) from the drill rig depending on ground conditions. Vibration attenuates

rapidly over distance, and any vibration would be temporary and short-term. Vibration would not affect any structures due to the rapid attenuation of vibration with distance.

Reclamation: Site re-contouring and reclamation activities would produce temporary noise from use of large equipment, similar to the equipment that would be used for the civil works phase. Noise during reclamation would be very short (a few days). Reclamation activities would take place during daytime hours. The noise impact would be similar to large truck noise, which is part of the ambient environment.

Impact Significance and Mitigation

The significance of each impact on noise sensitive receptors and mitigation measures that would be applied are summarized in the table below:

Table 7-7: Summary of Noise Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Residences	Daytime Noise(Civil Works)	Moderate	Moderate to High	Significant	Noise-1	Less than Significant
	Daytime Noise (Well Drilling and Testing)	Moderate	Moderate to High	Significant	Noise-1	Less than Significant
	Night-time Noise(Well Drilling and Testing)	High	Moderate to High	Significant	Noise-1	Less than Significant
Structures	Vibration (Well Drilling)	Moderate	Low	Negligible	--	--

7.2.5 Natural Habitats and Biodiversity

Loss of vegetation and trees

Civil works conducted under the proposed project will lead to loss of vegetation. This will lead to loss of nesting grounds for avifauna, bees and dry season fodder for pastoralists and dairy farmers. The community asked the proponent (GDC) and contractor to consider replanting de-graded areas with indigenous trees when the project is completed. The figures below show some vegetation, trees and nesting places that may be affected along the proposed project area.

Sensitive Resources

Sections of the proposed project areas consists of disturbed and agricultural production areas. Few sections however are covered by undisturbed natural vegetation. No sensitive or critical natural sites occur in the areas that would be directly affected by the proposed project activities. There are no rare, endangered or protected species present, and no areas of high biological diversity or endemism. No endangered or vulnerable plant, mammal, lizard, reptile or insect species are known to occur in the area. The sensitivity of biological resources within the drilling area is low.

The sensitivity of forested areas adjacent to the proposed project area is moderate.

Figure 7-4: ***Nesting trees just outside the perimeter of proposed project location***

Figure 7-5: Maize plantations within the proposed project site

Figure 7-6: ***Tree species that may be affected during proposed project implementation***

Figure 7-7: Some common vegetation within the proposed project site

Potential Risks/Impacts and Magnitude

Direct Impacts on Habitat and Species (Civil Works): Access road grading and well pad construction in agricultural areas or disturbed habitats would not have an adverse impact on natural communities or biodiversity because no natural communities occur in the area. Wildlife would tend to avoid areas of noise and human activity. Biological surveys of the proposed drilling areas did not identify sensitive biological resources within any drilling site. Well pad construction and access road grading within the surveyed drilling areas would not directly affect any natural habitats or sensitive species because the potential drilling areas are agricultural or barren areas with no suitable habitat for sensitive biological resources.

Characterization of flora and fauna was conducted at MS-201, MS-202 MS-203, MS-204 and MS-205. (Refer to 2.9.6 *Biodiversity of Plant Species within the Study Area*). All the sites were found to contain section disturbed agricultural lands and residential disturbed areas and the areas have a low potential for sensitive biological resources. It is unlikely that sensitive biological resources could occur in the areas.

Indirect Impacts on Habitat and Species (Civil Works and Well Drilling)

a) Invasive Weeds

Construction equipment, vehicles, and drill rigs can carry mud and invasive weed Larger grain borer (*Prostephanus truncates*) Serpentine leafminer (*Liriomyza trifolii);* Western flower thrips (*Frankliniella occidentalis)* Cypress aphid (Cinara cupressivora); Russian aphid (*Diuraphis noxia*); Cassava mealybug (*Phenacoccus manihoti*) through their fragments or seeds on the vehicle and equipment tires or undercarriage. Invasive weeds could be introduced to the proposed project area and surroundings through imported construction equipment and drill rigs. Invasive weeds can outcompete native vegetation and cause loss of habitat and potentially increased risk of wildfire. Introduction of invasive weeds was identified as a threat to the biological diversity. The introduction of invasive weeds could adversely impact native habitats surrounding the potential drilling areas.

b) Noise

Heavy equipment used during civil works and well drilling activities will produce noise levels that exceed the ambient noise conditions in the area (refer to Section 3.5.4 for predicted noise levels). Noise from heavy equipment and the drill rig could disturb wildlife and interrupt bird nesting behaviour. An intermittent increase in noise could potentially cause nest abandonment if birds are nesting near the drilling area. Disturbing nesting behaviour or causing nest abandonment could adversely impact bird populations. Drilling noise levels would be fairly constant over the drilling period. Drilling noise is not expected to cause nest disturbance because any species nesting in the vicinity of the drilling area would be accustomed to the constant noise level; however, drilling noise could cause birds to avoid habitat in proximity to the drilling areas.

c) Worker Behaviour

Workers could attract wildlife to the construction area if they were to feed wildlife or improperly store food waste. Attracting wildlife to the work area could put wildlife in danger or injury or mortality from heavy equipment or vehicles.

Reclamation: Reclamation activities would return the well pads to the preconstruction state. Drill pads would be revegetated to match pre-construction conditions. Reclamation activities would not adversely affect biodiversity or natural habitats.

Impact Significance and Mitigation

The significance of each impact on natural habitats and biodiversity and the mitigation measures that would be applied are summarized in the table below:

Table 7-8: Summary of Natural Habitats and Biodiversity Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Rare Species	Unknown Resources across all proposed site	Very Low to High	Moderate	Significant	Biodiversity-1	Less than Significant
Natural Habitats	Introduction of Invasive Weeds	High	Low	Potentially Significant	Biodiversity-2	Negligible

Priority Birds	Nesting Disturbance	High	Moderate	Significant	Biodiversity-3	Negligible
Wildlife	Attracting Wildlife	Low	Moderate	Potentially Significant	Waste-1	Negligible

7.2.6 Archaeological and Cultural Resources

Menengai West in Nakuru County, the area in which the proposed well drilling sites have been proposed, is not known for significant amounts archaeological artefacts. However, both prehistoric and early colonial artefacts may not be completely ruled out. In this study, two sites are likely to be culturally sensitive to the communities. Specifically, the proponent should conduct additional surveys for archaeological and cultural resources prior to civil work activities in MS 202 and MS 205.

The proposed site MS 202 was found to have one grave, which is approximately 20m from the proposed well drilling site. The survey would therefore be important to identify best locations for the proposed project components such well pads, ponds etc. This survey will also determine whether to relocate the proposed well site, relocate the grave, or re-planning of the arrangements of the proposed project components.

If the grave is to be relocated, the proponent should follow all procedures for relocation of grave. GDC should carry out consultative meetings with the affected community, the family of the deceased, relevant religious institution, and local authorities (the County Government) on modalities of the grave relocation and taking into consideration laws on cultural preferences and wishes of families. In addition, official notice is given to interested parties, it should be done:

1. With due regard to the views of the persons interested and the religious susceptibilities of the members of the religious community to which the person belonged whose grave or dead body it is;
2. In a manner which is not injurious to public health;
3. In accordance with such directions as may be given by the public officer appointed to supervise the undertaking; and
4. Accompanied by such religious rites or ceremonies as are appropriate to the religious community to which the person belonged whose dead body is removed.

GDC further consult with Ministry of Health, Internal Security as well as the County Government of Nakuru.

The proposed site MS 205 was found to have place of warship just outside the proposed project perimeter. Even though the church is not within the proposed project perimeter, the layout of the proposed project components should consider the church location. In addition, the MS 205 perimeter covers a derelict quarry land. If any sensitive resources are discovered, the resources shall be evaluated to determine appropriate treatment or avoidance procedures. If the sites contain resources or if inadvertent discoveries are made during construction, the testing and monitoring provisions detailed in Cultural-1 shall be implemented, as determined necessary by the archaeologist and GDC.

7.2.7 Landscape and Visual Character

Sensitive Resources

There are no scenic vistas within the proposed project area.

Potential Risks/Impacts and Magnitude

Civil Works: The removal of vegetation from access roads and well pads and the grading of well pads will have a temporary impact on the landscape and scenery in areas adjacent to proposed project sites. Substantial vegetation disturbance could have a minor but long-term impact on visual quality if the well pad and access roads with vegetation that contributes to scenic quality were not revegetated following proposed project activities.

Well Drilling: The presence of tall drill rigs and construction equipment would contrast with the natural landscape and temporarily degrade the visual quality near drilling areas. The drill rigs would only be in place during drilling and testing period. Trees, dense vegetation, and topography in the area would partially screen the drilling activities from views, such as those from the primary access roads.

Reclamation: Reclamation activities would be short-term and not have an adverse effect on the landscape or visual character of the area. Reclamation activities including site re-contouring, revegetation, and trash removal would restore the site to pre-construction conditions to avoid any long-term impacts on the landscape.

Impact Significance and Mitigation

The significance of each impact on landscape and visual quality and the mitigation measures that would be applied are summarized in the table below:

Table 7-9: Summary of Landscape and Visual Quality Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Proposed project sites	Vegetation Removal and Grading	High	Moderate	Significant	Landscape-1	Negligible to Less than Significant
	Visible Construction Equipment	Moderate	Low	Less than Significant	--	--
Views from Adjacent Roads and Residences	Vegetation	Low to	Low	Less than	--	--
	Removal and Grading	Moderate	--	Significant	--	--
	Visible Construction Equipment	Low to Moderate	Low	Less than Significant	--	--

7.2.8 Traffic Circulation and Safety

Sensitive Resources

The roads that would be used to access the drilling areas are used by community members, quarry vehicles, visitors and potentially tourists; traffic volume on the roads leading to the drilling area is

generally low. The existing road network are paved though dilapidated. The road that would be used by construction equipment to access the drilling areas is the primary access road to each community.

Potential Risks/Impacts and Magnitude

Road Expansion (Civil Works): The proposed project may require expansion of roadways at sharp turns where the turning radius is inadequate to support large equipment access. Expansion of the roadway could require temporary lane or road closures. Temporary road closures could disrupt the traffic circulation, may cause prolonged wait times during traffic control, and traffic detours to maintain community access. Roadwork could also create temporary traffic safety hazards during construction, or permanent hazards if improperly designed.

Large Vehicle/Equipment Transport (Civil Works and Well Drilling): The proposed project would involve operating large trucks on public roads to transport construction equipment and materials. Traffic controls, such as pilot vehicles and flaggers, may be necessary to safety manoeuvre large trucks through narrow roads and sharp turns. Temporary lane and road closures may also be necessary where access roads are constructed for the proposed project. Traffic controls would temporarily impact traffic circulation for infrequent and short periods during construction, which would not be significant. Temporary lane and road closures lasting more than a few hours could significantly disrupt traffic circulation, depending on the location and duration of the closure.

Reclamation: Site reclamation would require temporary travel of large construction equipment on area roads during site re-contouring and revegetation. Reclamation activities would be very short in duration (a few days) and would be conducted off area roadways within the well pad area. Reclamation would require little or no heavy equipment travel on area roads.

Impact Significance and Mitigation

The significance of each impact on traffic circulation and safety and the mitigation measures that would be applied are summarized in the table below:

Table 7-10: Summary of Traffic Circulation and Safety Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Traffic Circulation	Lane and Road Closures	Moderate	Moderate	Potentially Significant	Traffic-1	Negligible
	Transport of Large Equipment	Moderate	Moderate	Potentially Significant	Traffic-1	Negligible
Community Members	Traffic Safety	High	High	Potentially Significant	Traffic-1	Negligible
	Road Hazards	High	High	Potentially Significant	Traffic-2	Negligible

7.2.9 Utilities and Communications Systems

Sensitive Resources

Low-hanging utilities, including communication cables and electrical distribution lines, are located along area roads that would be used to access proposed project sites as well as near the drilling areas.

Potential Risks/Impacts and Magnitude

Civil Works, Well Drilling, and Reclamation: The proposed project would involve operating large trucks and equipment on area roads to access the work area. Low-hanging utilities and communications systems could be damaged in areas where there is inadequate clearance for large equipment to pass. Damage to utilities and communication systems could result in service interruptions to communities that are served by the utility lines.

Impact Significance and Mitigation

The significance of each impact on utilities and communication systems and the mitigation measures that would be applied are summarized in table below.

Table 7-11: Summary of Utility and Communication System Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Utility and Communication Utility Lines	Damage to Low Hanging Lines	Moderate	Moderate	Potentially Significant	Utilities-1	Negligible

7.2.10 Hazards and Hazardous Materials

Sensitive Receptors

The communities living near the drilling areas are at risk of hazards from construction operations. Sensitive receptors include residents near the drilling sites and community members who may use the roads or recreational facilities near the drilling areas. No schools are located in proximity to the drilling areas.

Workers would also be exposed to hazards and hazardous materials.

Potential Risks/Impacts and Magnitude

Hazardous Material Use (Civil Works and Well Drilling): Operation of construction equipment would involve the use of hazardous materials, such as fuels, oils, lubricants, and other chemicals. Wells would be drilled with water and non-toxic drilling mud; however,

materials extracted during the well drilling and testing process (e.g., cuttings and geothermal fluid) could be hazardous and contain toxic elements, such as heavy metals.

Hazardous materials, including potentially hazardous waste, would be transported, handled, and stored in accordance with applicable laws. If hazardous material and waste were not managed correctly, or if incidental leaks or spills occurred, the proposed project could contaminate soil and water quality. Contaminating soil and water quality could affect ground water, natural habitats, and agricultural production.

Geothermal Fluid Discharge (Well Drilling): Although unlikely, well drilling could result in an unanticipated release of geothermal gasses and fluid if a well blow out occurred. An uncontrolled release of geothermal fluid could expose people near the well to air contaminants as described in Section 7.2.1, water quality contaminants (see *Table 7-3*), and/or very high temperature fluid, which may be hazardous to community members and workers.

Reclamation: Reclamation would use equipment similar to that used in construction. Site clean-up and restoration would have minimal use of hazardous materials and the risk would be low.

Impact Significance and Mitigation

The significance of each impact on hazards and hazardous materials and the mitigation measures that would be applied are summarized in the table below:

Table 7-12: Summary of Hazards and Hazardous Materials Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Community Members and workers	Hazardous Material Discharge	High	Low	**Potentially Significant**	Hazards	Negligible
	Geothermal Gases and Fluid, and Well Blowout	High	Low	**Potentially Significant**	Water-3 Water-4 Air-3	Negligible

7.2.11 Fires

Sensitive Receptors/Resources

Uncontrolled wildfires can result in substantial damage to property, as well as injury or death. Wildfires can also result in substantial damage to natural habitats and biodiversity. The drilling areas have a low to moderate risk of wildfires during the dry season or periods of drought.

Potential Risks/Impacts and Magnitude

Civil Works and Well Drilling: The proposed project would have a low potential for causing fires during civil works and well drilling operations. The use of heavy construction equipment and welding could create sparks, which could potentially ignite a wildfire in nearby bush. Workers who smoke could also cause a wildfire if their cigarettes were not properly extinguished or smoking occurred in areas with dry vegetation.

The proposed project would involve operating large trucks and equipment near low-hanging utility lines, including power lines. Live power lines could cause electrocution and fires.

Well Testing: Geothermal testing would not pose a significant risk of fires because gases that are typically emitted from geothermal systems are not combustible.

Reclamation: Reclamations activities would consist of trash removal, site re-contouring, and revegetation. Reclamation activities would be conducted within the well pad, which would be free of vegetation. The risk of fire from site reclamation would be very low.

Impact Significance and Mitigation

The significance of fire impacts and the mitigation measures that would be applied are summarized in the following table

Table 7-13: Summary of Fire Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Mitigation Significance	Mitigation Measure	Residual Significance
Community Members, and Natural Habitats and Biodiversity	Fire from Workers Smoking	High	Low	**Potentially Significant**	Fire-1	Negligible
	Fire from Vehicle or Equipment Ignition	High	Low	**Potentially Significant**	Fire-1	Negligible
	Fire from Contact with Live or Low- hanging Power Lines	High	Low	**Potentially Significant**	Fire-1 Utilities-1	Negligible

7.2.12 Solid Waste

Sensitive Resources

The drilling areas are located within and near land used for agricultural production, and other residential activities. The presence of trash or waste in these areas could degrade the existing environment, attract wildlife, and affect existing land uses, such as agricultural land.

Potential Risks/Impacts and Magnitude

Civil Works and Well Drilling: The proposed project would generate non-hazardous solid waste from worker subsistence (i.e., food trash, water bottles, etc.) and from miscellaneous construction waste, such as material packaging and containers. If the waste was not contained and disposed of properly, the surrounding environment could be degraded by litter.

Well Drilling and Testing: The geothermal well drilling and testing process would produce drill cuttings that would be stored on site in sumps or tanks and would not require disposal at the landfill unless the cuttings require treatment as hazardous materials.

Reclamation: Site reclamation would include site clean-up and restoration. The wellhead, if no longer needed, would be removed and recycled. Trash would be hauled away. Limited quantities of waste would be produced during site reclamation.

Impact Significance and Mitigation

The significance of solid waste impacts and the mitigation measures that would be applied are summarized in the table below:

Table 7-14: Summary of Solid Waste Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Farmers and Community Members	Construction Waste and Debris	Moderate	Low	**Potentially Significant**	Waste-1	Negligible

7.3 SOCIAL RISKS AND IMPACTS

7.3.1 Community concerns

Community members wanted to know about the amount of land required for the well drilling and the way-leave during the laying of water pipelines. For purposed of geothermal exploration, it was explained that a total area of 140m by 120m (i.e 16,800 sq.m, equivalent to 4.15 acre-US, or 1.68Ha) would be leased. For the proposed water pipeline to deliver water to the proposed project sites, it was explained that 9 metre way-leave was necessary. However, most section of the wayleave are available through the road networks in the area, and therefore minimal private lands would be affected. In addition, it was made clear that the affected persons would be expected **not** to erect any permanent

structures within the way leave and well construction sites after the cut of date (COD) set on the date of **15 November, 2018**. Compensation due to this loss of use would be discussed with the communities during the Resettlement Action Plan (RAP) which would be conducted prior to proposed project implementation. Further details on the PAPs and affected land are provided in the LACP report attached.

Other social risks have been discussed in the subsequent subchapters:

7.3.2 Livelihoods

Sensitive Receptors

The potential drilling areas in are under various economic activities, including quarry and agricultural production. The livelihoods of farm owners and workers could be impacted, if the project causes a reduction in agriculture production.

Potential Risks/Impacts and Magnitude

Direct Impact on Livelihoods (Civil Works and Well Drilling): The proposed project would temporarily disrupt agricultural production where well pads and access routes would be located on land that is currently used for agricultural production. Depending on the location of the well pads and access roads, the proposed project could impact farms. Construction of the well pads would remove that area from agricultural production for the life of the well pad. The area would be lost to agriculture for a few months to 1 year if:

- The slim-hole well testing results do not show promising increase in temperature at depth and the well is not suitable for monitoring
- The slim-hole well geology does not indicate the presence of a geothermal resource
- The slim-hole well (if it is designed to penetrate the geothermal resource) does not show adequate temperature, permeability, and fluid and the well is not suitable for monitoring
- The full-size well does not encounter a geothermal resource with adequate temperature, permeability, and fluid flow and the well is not suitable for monitoring

Unsuccessful wells would be plugged, abandoned, and the well pad restored. A well that may be suitable for monitoring or further study may retain the wellhead requiring up to 5 square meters (16 square feet) of permanent impact, with the majority of the well pad revegetated and restored. Monitoring could continue at a restored well pad.

Short-term impacts could occur through well drilling and restoration (approximately 2 to 10 months) where annual row crops are present. Where mature trees could not be avoided, the impact would occur for a longer period (up to several years) until the new trees matured and reached the same production levels. Impacts on agriculture production and compensation are discussed further in LACP Report (Annexed).

Wells that are successful, encounter a geothermal resource, and are designated for further drilling or testing may be removed from agricultural production for several years to up to 30 years or more if a power plant is built.

The graded well pad and access road could result in the long-term loss of agricultural productivity if the well pad site was not properly restored to pre-construction conditions with productive topsoil.

The proposed project has the potential to create temporary construction jobs for local community members during the civil works and drilling phase. Although the extent of job opportunities and hiring is unknown at this time, providing local communities with job opportunities would be a positive impact.

Indirect Impacts on Livelihoods

Geothermal Emissions (Well Testing): Geothermal emissions may result in some geothermal steam particulates landing on nearby crops. Some crops (especially beans) are sensitive to boron and could be affected if geothermal steam particulate settle on the crops. Leaf injury must be severe to cause reduced crop quality and yields. Long- term use of irrigation water containing more than 0.5 ppm of boron can reduce yields of bean, onion, garlic; 0.7 ppm can reduce yields of carrot, potato and 2 ppm can reduce yields of cabbage. The amount of boron that would be deposited on crops would be low because the droplets settle out close to the emission point and land on the well pad and the testing would be short duration (days). Impacts to agricultural production and required compensation are described in detail in the LACP Report (Annexed).

Water Supply and Topsoil Loss: The proposed project could degrade soil fertility used for agriculture and could also cause loss of topsoil due to erosion; these project impacts have the potential to adversely affect agricultural production.

Reclamation: Reclamation would restore the sites to agricultural production and would avoid long-term impacts from loss of productive use of the land. The reclamation process would likely require local labor, which would also have a positive impact on livelihoods.

Impact Significance and Mitigation

The significance of impacts on livelihoods and the mitigation measures that would be applied are summarized in the table below; The RAP also identify measures to reduce or avoid impacts (refer to Section 7.3.4).

Table 7-15: Summary of Livelihood Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Farmers	Short-term Loss of Livelihood	High	High	**Significant**	Social-1 Soils-1 Landscape-1	Negligible
	Long-term Loss of Livelihood	High	Low	**Potentially Significant**	Social-1 Soils-1 Landscape-1	Negligible
Community Members	Temporary Construction Jobs	--	--	Positive	---	--

7.3.3 Tourism

Sensitive Receptors/Resources

Tourism is the primary economic activity in Kenya. Many scenic tourist destinations, including the Menengai Caldera are within Nakuru County, the proposed project region. The protection of the tourist industry and tourist resources is a top priority for the Government of Kenya and community stakeholders.

No tourist destinations, such as hotels or popular places of interest, are located in close proximity to the potential drilling areas. Intervening topography and dense vegetation would restrict views of the drilling areas and proposed project activities.

Potential Risks/Impacts and Magnitude: If the large truck is imported, the truck traffic could have a minor effect on tourist traffic near Port. Also during transportation of the equipment, some road users, including tourists may be shortly affected.

Temporary construction noise (refer to Section 7.2.4), landscape impacts (refer to Section 7.2.7) could affect tourists in a similar manner as local residents; however, the proposed project would not displace tourism activities or the livelihoods of those working in the tourism industry. The geothermal drilling could be of interest to tourists and could be a

positive impact, bringing tourists to the area that may increase spending in the local community.

Impact Significance and Mitigation

The significance of impacts on tourism and the mitigation measures that would be applied are summarized in the table below:

Table 7-16: Summary of Tourism Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Tourism	Visual	High	Very Low	Negligible	--	--
	Noise	High	Very Low	Negligible	--	--
	Traffic	High	Very Low	Negligible	--	--

7.3.4 Resettlement

Sensitive Receptors

The affected structures and the agricultural land uses in the proposed project area could be affected during civil works and well drilling activities. Implementation of the proposed project is expected to cause loss of land and property in some sections. Proposed project sites MS 204 and MS 203 have structures located within the proposed project sites. For MS 201, MS 202 and MS 205 no structures are located within the potential drilling areas where well pads will be based. Project Affected Persons expect adequate compensation from GDC for the loss prior to project implementation. It was noted that no permanent house / structures would be affected by the proposed project. However only a few structure (less than five) would be affected. Partial/ complete acquisition/ easement of land and trees would the main concern during compensation. Details on the latter have been given in the appended LACP Report.

The community members also recommended that the compensation of trees be based on type, age and beneficial value. The figures below show some of the affected structures within the proposed project location.

Figure 7-8: Housing structure within the proposed project location-MS (approximately 30m from well site)-MS 203

Figure 7-9: A PAP *within her semi-permanent house near 'Project' (well MS-204) - Approximately 50 from the proposed well site.*

Potential Risks/Impacts and Magnitude

Direct Impacts (Civil Works and Drilling): Resettlement refers to the potential displacement of people or existing land uses. Other than the few affected individuals identified in LACP Report, it is however not anticipated that the proposed project would require direct resettlement of the entire communities or residences because there are adequate open spaces within the drilling areas to build the well pads. ***A slim-hole well pad is approximately 40 by 30 meters (0.1 hectare or 0.25 acre). Well pads for full-sized (deep) wells are generally 100 by 100 meters (330 by 330 feet) or approximately 0.8 to 1.6 hectares (2 to 4 acres) in size.***

The well pad-siting goal is to reach the geologic targets, and avoid drilling in close proximity to residences if possible. The actual locations will be sited based on these factors as well as access and surface conditions.

The proposed water pipelines to deliver water to the proposed drilling sites have expanded the area of impact on livelihoods and the area requiring compensation for loss. This impact is addressed in the LACP Report.

Indirect Impacts: It may be necessary, for safety reasons or to avoid substantial noise disruption, to temporarily vacate residents in close proximity to well pads during construction and/or drilling, such as during potential emergency situations (addressed in Section 7.3.6). Any evacuation of residents would be very short (a few hours) and would not cause resettlement.

The proposed project would temporarily impact agricultural land during construction and restoration as described in Section 7.3.2. Impacting food supply and the livelihoods of farm owners and farmworkers could cause indirect resettlement. Resettlement without appropriate compensation would be a significant impact.

A LACP was developed to address anticipated resettlement for the proposed project (displacement of agricultural land uses) (Annexed).

Impact Significance and Mitigation

The significance of impacts on resettlement and the mitigation measures that would be applied to reduce the impact are summarized in the table below:

Table 7-17: Summary of Resettlement Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Farmers	Displace Agricultural Production	High	Moderate	**Potentially Significant**	LACP/ RAP	
Community	Emergency Evacuation	High	Low	**Potentially Significant**		
Farmers	Travel Outside Approved Work Areas	High	Moderate	**Potentially Significant**	Social-1	

7.3.5 Working Conditions and Equality

Sensitive Receptors

Women are vulnerable to sexual harassment and abuse and should be afforded special considerations and protection. Religious minorities, ethnic minorities, or economically disadvantaged communities are also vulnerable to discrimination and disproportionate impacts. In the workplace, these groups can also be vulnerable to unequal job opportunities, unequal pay, and workplace harassment. Poor labor and working conditions can result in worker exploitation and abuse.

Potential Risks/Impacts and Magnitude: The proposed project would comply with applicable laws and policies governing labor rights and working conditions. The proposed project would also incorporate best international practices, including but not limited to the World Bank EHS Guidelines and policies relevant to working conditions and equality to ensure and safe and equitable environment for all workers.

Impact Significance and Mitigation: The significance of impacts on working conditions and equality and the mitigation measures that would be applied are summarized in the table below:

Table 7-18" Summary of Equality and Working Conditions Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Community members	Harassment from workers	Moderate	Moderate	**Potentially Significant**	Social-2	Negligible
Workers	Workplace harassment	Moderate	Moderate	**Potentially Significant**	Social-2	Negligible

7.3.6 Labour Influx

Sensitive Resources

The potential drilling areas and worker camp are located near communities with limited housing resources.

Potential Risks/Impacts and Magnitude: The proposed project could attract locals from surrounding communities seeking possible employment opportunities which could temporarily increase community population and housing demand for the duration of construction period. The majority of workers without available housing would be provided housing at the worker camp, and the proposed project would not involve long-term jobs; therefore, it is unlikely that people seeking work would permanently migrate to communities where project activities would occur.

Impact Significance and Mitigation

The significance of impacts on labor influx and the mitigation measures that would be applied are summarized in the table below:

Table 7-19: Summary of Labor Influx Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Local communities	Labor Influx	High	Low	Less than Significant	--	--

7.4 HEALTH AND SAFETY

7.4.1 Worker Health and Safety

Sensitive Receptors

Workers would have the greatest potential for health and safety risks as a result of the geothermal exploration activities because workers would be directly engaged in the geothermal exploration process.

Potential Risks/Impacts and Magnitude: The proposed project would expose the labor workforce to hazards during construction that pose a risk of bodily injury or death. The primary hazards

that may be encountered during construction can be generally categorized as either occupational or environmental. Typical occupational hazards associated construction include working with moving machinery and motorized equipment, working at heights or in confined spaces, open holes and trenches, repetitive motions, falling objects, exposure to heat (i.e., hot weather, fluids, or objects), fires, loud noises, and hazardous materials (refer to Section 7.2.10). Less common occupational hazards that may be encountered during geothermal drilling and testing include exposure to potentially harmful geothermal gases, hot geothermal fluids and drilling materials, and hazards associated with a potential well blowout.

Workers could also be exposed to biological hazards in the environment such as those associated with dangerous or infectious insects, animals, and plants.

If proper safety precautions were not taken, then workers could be exposed to very high levels of noise that could result in hearing damage. Hearing damage can occur from exposure to moderate noise levels (85 to 100 dBA) over a few weeks, or exposure to high noise levels (>100 dBA) for shorter periods (refer to *Table 3-4: Noise Level Guidelines)*. The frequency of exposure plays a large role in the risk of hearing damage. Workers must wear proper hearing protection when noise levels exceed 85 dBA.

Impact Significance and Mitigation: The significance of impacts on worker health and safety and the mitigation measures that would be applied are summarized in the table below:

Table 7-20: Summary of Worker Health and Safety Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Workers	Occupational Hazards	High	High	Significant	Safety-1 Safety-2	Less than Significant
	Noise	High	High	Significant	Noise-1	Less than Significant
	Geothermal Gases	High	High	Significant	Water-4 Air-3	Less than Significant
	Disease	High	Moderate	Potentially Significant	Safety-1	Negligible

7.4.2 Community Health and Safety

Sensitive Receptors

The proposed project could expose the local community members to the same hazards as workers; however, the risk of such hazards would generally be reduced with distance from proposed project

areas. Community members who are living or using property adjacent to the well pads and access roads would be exposed to the greatest risk of hazards.

Potential Risks/Impacts and Magnitude

Community Hazards from Civil Works and Drilling Activities: The public would generally be restricted from entering well pads where the hazards are greatest; however, the public could still be exposed to hazards at the periphery of work areas or within access roads. Hazards to the community would include moving vehicles and equipment, hazardous materials, open holes and trenches, fires, potentially harmful geothermal gases, and hazards associated with a potential well blowout.

Disease: The proposed project would involve bringing foreign workers to the proposed project areas. Foreign workers could expose local people to new diseases, and vice versa. The risk of transferring diseases between workers and the local population would not be significantly different that the same risk between tourists and the local population. The proposed project workforce would be limited to approximately 50 people at any given stage of construction, some of whom may be hired from the local population. Bringing few expatriates foreign workers to local would have an insignificant effect on the local population compared to the tourist industry; however, workers could be exposed to new diseases in the region or experience an injury or medical emergency.

Impact Significance and Mitigation

The significance of impacts on community health and safety and the mitigation measures that would be applied are summarized in the table below:

Table 7-21: Summary of Community Health and Safety Impacts and Mitigation

Resource/ Receptor	Impact	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measure	Residual Significance
Community Members	Construction Hazards	High	Low	**Potentially Significant**	Safety-4	Negligible
	Noise	High	High	**Significant**	Noise-1 Social-4	Less than Significant
	Geothermal Gases	High	Moderate	**Significant**	Water-4 Air-3	Negligible
Disease		High	Low	Less than Significant	--	--

8 IMPACT MITIGATION AND ENHANCEMENT MEASURES

8.1 Overview

This section identifies the mitigation measures that would be implemented to address the risks and potential impacts described in in the preceding chapter. Mitigation measures for the proposed project are separated into three categories: environmental, social, and health and safety; however, elements of some mitigation measures are applicable to more than one category.

Mitigation measures were designed to avoid or reduce impacts to less than significant levels. In addition to the full text of the mitigation measures, the following elements are provided for each measure:

- The issue or potential impact being mitigated identified in Chapter 7
- The parties responsible for implementing the described requirements
- The general timing when implementation is required

The construction contractors (e.g., civil and drilling) would have the primary responsibilities for implementing the mitigation requirements; however, the GDC, through it project unit, would also be responsible for implementing some requirements where specified. The unit would be responsible monitoring, documenting, and reporting implementation of the mitigation measures. These roles and responsibilities are described in detail in the ESMP.

8.2 ENVIRONMENTAL MITIGATION MEASURES

Table 8-1: Environmental Mitigation Measures

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
I. Water Resources			
• Water Quality • Erosion and Topsoil Loss • Landslides and Mudflows	**Water-1: Storm water, Erosion, and Sediment Control** Storm water runoff and drainage shall be properly managed at all work areas using best management practices (BMPs) (e.g., procedural actions and/or material installations). BMPs and drainage systems shall be designed to accommodate rapid rainfall events that can be expected in the region. The following procedures shall be implemented to prevent soil loss, erosion, and sediment transport in proposed project areas: • Proposed project activities shall be scheduled to avoid the heaviest rain season, to the extent possible. • Soil disturbance shall be limited to the minimum amount necessary. • All disturbed areas shall be stabilized as soon as possible (i.e., covered, compacted, or secured with BMP materials). • Proposed project traffic shall be restricted to designated areas. • Pipelines shall be monitored for leaks and any leaks shall be repaired immediately. • Sediment shall be controlled and prevented from leaving disturbed proposed project areas. All BMPs shall be properly inspected and maintained on a frequent basis to ensure they are functioning properly.	• Civil Works Contractor • Drilling Contractor/GDC	• Before Construction • During Construction
• Water Quality	**Water-2: Water Quality Monitoring Program** The drilling contractor/GDC shall implement a ground water quality-monitoring program to ensure the proposed project does not cause or substantially contribute to a condition that exceeds acceptable water quality standards. Water quality sampling shall occur prior to the start of proposed project activities to determine the baseline contaminant levels, and then every few weeks during project activities in the area, in order to determine if the proposed project is reducing water quality. If it is determined that the proposed project is reducing water quality, the drilling contractor/GDC shall make the appropriate adjustments to the construction activities to correct the problem. Water quality monitoring and any necessary supplemental water supply shall continue until the water conditions are safe and returned to pre-project conditions. In the unlikely event that water quality is impacted for a long-term basis (longer than project activities are occurring), long-term water treatment and/or supply systems shall be considered that provide safe water to those affected at pre-project constituent and flow levels.	• Drilling Contractor/GDC	• Before Construction • During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Water Quality • Hazardous Materials	**Water-3: Drilling Waste and Effluent Management** The drilling contractor shall incorporate specific procedures for managing drilling waste and effluent into the Hazardous Materials Management Plan and the Waste Management Plan. All drilling muds, fluids, and cuttings shall be tested for water quality parameters before discharging such fluids into the environment or disposing the materials into landfills, to ensure contaminant levels in wastewater do not exceed acceptable standards and are disposed of properly in accordance with the Waste Management Plan. Water quality parameters that may be sampled include: pH, Temperature, Boron, Bicarbonate, Calcium, Chloride, Sulfide, Iron*, Fluoride, Copper, Cadmium, Mercury, Lead, Chromium (hexavalent* and total), Nickel, Arsenic, Vanadium, and Silver.[7] Geothermal fluid shall also be tested for the following radiological elements: Radium 226/228 (combined), gross alpha (adjusted), and uranium. Fluid that exceeds acceptable standards shall be contained and/or disposed of in accordance with applicable laws and policies. Reserve pits for drilling materials shall be maintained in proper functioning order with a minimum of 0.5 meter (1.6 feet) of freeboard at all times. If foams are applied to the drilling fluid, the drilling contractor shall cover any reserve pits containing drilling cuttings or line the downwind perimeter of the reserve pits with hay bales or equivalent to prevent the foam from being transported offsite via wind. Drilling fluids, mud, and spoils shall be stored in either storage tanks or reserve pits adjacent to the wells. Drilling fluids shall be reused to the extent feasible to conserve freshwater.	• Drilling Contractor/GDC	• During Construction
• Water Quality • Geothermal Emissions • Hazards	**Water-4: Blowout Prevention** All drill rigs used during the exploration program shall be equipped with blowout prevention (BOP) equipment to prevent blowout if the geothermal resource is encountered. GDC shall require that the drilling contractor or the drilling supervisor have experience in geothermal drilling. Drillers shall receive proper training for response to blowouts, should one occur. The drilling contractor shall prepare and implement a Well Blowout Prevention and Containment Plan. At a minimum, the plan shall address the following: • Proper use of BOP equipment that meets industry standards	• GDC (Project Unit) • Drilling Contractor	• During Construction

[7] *Note: Elements marked with an asterisk (*) require testing within 24 hours due to short hold times. If it is not feasible to transport the samples to a certified lab within the specified hold times, testing shall be conducted on site.*

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	• Specific procedures for preventing and controlling an incidental blowout, such as using a blowout preventer stack and stocking material for quelling the blowout • Training requirements for all workers that may be exposed to a well blowout • Staffing requirements to ensure qualified individual(s) who are certified in well control and blowout response are present during all drilling operations • Blowout documentation and clean-up procedures		
• Water Supply (Existing and Proposed)	**Water-5: Water Supply System Protection** Public and private water supply systems (i.e., pipes and ditches) shall be identified and marked for avoidance prior to initiating project activities that could damage such systems. If water supply systems are inadvertently damaged, they shall be repaired immediately. Water shall be supplied to the affected community members if their regular water supply is interrupted. GDC will consider the community benefit of leaving water supply systems that are developed for the project (i.e., piped network) after exploration drilling is complete. Other important management/measures that the key contractors shall undertake include • GDC and the Contractor shall ensure that necessary approvals/permits from the water authorities for the abstraction of water is adhered to; • Accidental leakages and bursts of water supply pipelines should be reported and repaired immediately; • Recycle water as much as possible should be encouraged for example water used for curing of concrete can be used for spraying dusty roads; • Control of the water flows and the water consumption records must be kept and availed to the relevant authorities • All employees should be sensitized on water usage practices like discouraging unnecessary opening of taps; • Monitoring of taps and their efficiency should be done regularly; • Where feasible, curing of concrete should be done in conservancy tank to avoid wastage; • Harvest water during rainfall times to complement other sources; • The Contractor will be required to comply with the water quality regulations; • No grey water runoff or uncontrolled discharges from the site/working areas (including wash-down areas) to adjacent watercourses and/or water bodies shall be permitted; • Water containing pollutants such as cements, concrete, lime, chemicals and fuels shall be discharged into	• GDC – Project Unit • Civil Works Contractor • Drilling Contractor	• Before Construction • During Construction • After Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	a conservancy tank for removal from site; • The Contractor shall instruct their staff and sub-contractors that they must use toilet provided and not the bush or watercourses; and • Continued monitoring of underground water levels.		
• Water Supply to Well Sites	**Water-6: Water Extraction Strategy** GDCshall develop a strategy for obtaining water that does not disrupt the water supply for domestic and agricultural users. Water extraction for the proposed project, including the locations of water pipelines and tanks, shall not deplete water reserves used by the community. Even though the proponent well develop, own supply infrastructure, GDC and drilling contractor shall consult with NAWASSCO and Water Resource Agency (WRA) on water extraction and utilisation by the proposed project. Water infrastructure and potential hazards where pipelines cross roadways shall be clearly marked with signs and/or flagging. During the pipeline construction, the contractors/GDC shall restrict themselves on the road reserves and minimise vegetation destruction. Before conducting any roads cutting, the contractors shall seek approvals from relevant Authorities: (Kenya Urban Roads Authority-KERRA, Kenya Rural Roads Authority-KURA, or The County Government of Nakuru, depending on the road type)	• GDC – Project Unit • Drilling Contractor/GDC	• Before Construction • During Construction
II. Air Quality			
• Air Quality	**Air-1: Dust Management** The following procedures shall be implemented where dry exposed soils are located in proposed project areas: • Water shall be applied to active construction areas to prevent visible dust, to the extent that water is readily available. Water shall not be over applied so that it creates runoff that leaves the site. As an alternative to water, chemical stabilizers or surfactants may be applied to disturbed areas, being careful to not allow overspray on nearby vegetation. • Vehicle speeds shall not exceed 25 kilometres (15 miles) per hour on unpaved surfaces. • Inactive areas shall be covered or otherwise stabilized to reduce the potential for wind transporting dust. • Disturbed areas shall be stabilized and restored once project activities are completed.	• Civil Contractor • Drilling Contractor/GDC	• During Construction
• Air Quality	**Air-2: Construction Emissions Controls** The construction contractors shall be responsible for ensuring all vehicles and equipment are properly operated and maintained according the manufacturer's specifications, and equipped with appropriate	• GDC – Project Unit • Drilling	• During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	emission control devices (i.e., catalytic converters, etc.). Malfunctioning equipment shall be repaired immediately or removed from the site.	Contractor/GDC	
• Worker Health and Safety Community Health and Safety	**Air-3: Air Quality Monitoring and Noxious Gas Management** The drilling contractor/GDC shall be responsible for managing risks to workers and local communities from potentially harmful geothermal gas emissions (e.g., hydrogen sulphide, carbon dioxide, boron, arsenic, mercury, and bicarbonate) during well drilling and testing. At a minimum, the following procedures shall be implemented during drilling and testing activities: • Well drilling or testing that could cause the release of potentially harmful geothermal gases shall not occur where the public could be put at undue risk. An appropriate geothermal gas hazard zone shall be established around well sites based on the risk of gas release from the drilling and testing activities that would occur. The hazard zone shall be marked with signs and communicated to the local community members. If occupied structures would be located within a hazard zone, the drilling site must be relocated or drilling activities shall be limited to techniques that would not release unsafe levels of geothermal gases, such as surface coring. • Minimize the potential for gas release by using properly weighted drilling mud to keep the well from flowing or by implementing other well head abatement measures. • Install gas detection and monitoring devices during well drilling and testing activities, that are equipped with alarms that would be trigged if gas concentrations reach unsafe levels. • Autonomous respiratory equipment shall be provided in enclosed areas of the drill rig. • The Health and Safety (HS) Plan shall specify safety procedures for potential exposure to geothermal gases and emergency response. The drilling contractor shall implement an air quality monitoring program to monitor air quality during well drilling and testing for signs of unsafe levels of potentially harmful geothermal gases using automated detection and alarm systems. If unsafe gas levels are detected, the area shall be evacuated and properly trained workers wearing appropriate PPE shall attempt to stop the release by injecting hydrogen peroxide, capping the well, or another suitable method.	• Drilling Contractor/GDC	• During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
III. Geology and Soils			
• Topsoil Loss	**Soils-1: Topsoil Preservation and Restoration** Where grading occurs within farmland, topsoil shall be separated and stockpiled during the construction period. The topsoil stockpile shall be secured with plastic and BMP materials. Following construction, the topsoil shall be applied evenly to the site during the restoration process. The topsoil shall be properly compacted and stabilized to prevent erosion and sediment transport.	• Drilling Contractor/GDC	• Before Construction • During Construction
• Unstable Slopes and Saturated Soils	**Soils-2: Geotechnical Investigation** The civil works contractor/GDC shall complete a geotechnical investigation prior to initiating civil works activities for access road expansion or well pad construction in all the proposed sites. The contractor shall implement all recommendations contained in the geotechnical investigation.	• Drilling Contractor/GDC	• Before Construction • During Construction
• Noise	**Noise-1: Noise Abatement and Community Coordination** Construction noise and the associated effects shall be reduced or minimized, to the extent possible, by implementing the following procedures: • Select quieter equipment and construction activities, whenever feasible; • Ensure motorized vehicles and equipment are equipped with the greatest possible noise reduction parts, such as mufflers, silencers, insulators, and enclosures; • Limit civil work activities to daytime hours (07:00 to 18:00), to the extent feasible; • Minimise civil works during sensitive morning, evening, and night-time periods, to the extent feasible; • Notify and coordinate with residents adjacent to project areas prior to construction to inform them of the possibility of temporary noise disruption, and how to report noise complaints; • Install acoustic barriers between stationary equipment and sensitive receptors located within 300 meters (1,000 feet); • Use a rock muffler or other effective, industry standard silencer during well testing; • Notify community members at least 24 hours prior to conducting well tests; • Implement a Noise Complaint Program to record and respond to noise complaints during construction.	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
IV. Natural Habitats and Biodiversity			
• Impact on natural sources of construction materials	• The contractors, in consultation with GDC will ensure that the obtain appropriate authorization including from NEMA. WRA and Mines and Geology departments to do or use any proposed borrows pits and quarries. These should be obtained before commencing activities; • Any new borrow pits and quarries shall be located more than 100 meters from watercourses in a position that will facilitate the prevention of storm water runoff from the site from entering the watercourse; • Notice will be given 14 days to nearby communities of intention to excavate in the borrow pits or quarries; • Borrow areas' rehabilitation plans will be prepared prior to use and approved by the local authorities; • Storm-water and groundwater controls through appropriate drainage shall be implemented to prevent runoff entering streams and the slumping of soil from hillside above; • The use of borrow pits or quarries for material spoil sites must be approved by the local authorities (and/or with the appropriate consent of the "landowner"). Where this occurs, the materials spoiled in the borrow pit shall be profiled to fit into the surrounding landscape covered with topsoil and re-vegetated. and • No rock blasting is anticipated. However, in the event that blasting for rock is found necessary: ▪ A current and valid authorization from the Department of Mines prior to any blasting activity shall be obtained; ▪ A qualified and registered blaster by the Department of Mines and Geology shall supervise all blasting and rock-splitting operations at all times. ▪ The Contractor/GDC shall ensure that appropriate pre blast monitoring records are in place (i.e. photographic and inspection records of structures in close proximity to the blast area); ▪ GDC and the Contractors shall ensure that emergency services are notified, in writing, a minimum of 24 hours prior to any blasting activities commencing on Site; ▪ GDC and the Contractor shall take necessary precautions to prevent damage to special features and the general environment, which includes the removal of fly-rock. Environmental damage caused by blasting/drilling shall be repaired at the Contractor's expense;	• GDC (involve NEMA, WRA, KWS, KFS)) • Civil Contractor/GDC	• Before Construction • During Construction
• Biodiversity	**Biodiversity-1: Pre-Construction** The contractor /GDC shall ensure that vegetation/trees are cleared only when it is inevitable. When the work is completed, with assistant from community, KWS and KFS, GDC should initiate a tree planting exercise	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction • GDC

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Natural Habitats	**Biodiversity-2: Invasive Weed Control** All equipment shall arrive at the work site clean and free of caked mud and plant material.	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction
• Nesting Birds	**Biodiversity-3: Nesting Bird Avoidance and Impact Minimization** Well pads shall be positioned at least 75 meters (250 feet) from the forested areas where suitable nesting habitat for priority bird species may be located. ESIA process did not encounter nesting birds within any proposed site at the time of study. However, due to their dynamic nature, prior to well drilling, a survey potentially suitable nesting habitat for priority species birds should be undertaken. If active nests are identified, a biologist shall monitor the nesting birds responses to the loudest level of construction noise for an appropriate duration. If the nesting birds show signs of disturbance that could result in nest failure, all work activities that disturb the birds shall be temporarily halted and visual and acoustic barriers shall be erected between the nesting location and work areas. Installation of any visual and acoustic barriers shall be overseen and approved by the qualified biologist. Also the document recommends development and implementation of an avifauna monitoring scheme, assessing bird population trends and direct hazards relating to the project	• Drilling Contractor/GDC • Civil Contractor/GDC • GDC	• Before Construction • During Construction
V. Archaeological and Cultural Resources			
• Archaeological and Cultural Resources	**Cultural-1: Archaeological Testing or Monitoring** The contractor shall either conduct subsurface archaeological testing prior to grading and earthwork. If the results of the subsurface testing indicate the presence of subsurface archaeological resources, archaeological monitoring shall be conducted during grading and earthwork in the drilling area. Archaeological Testing. Prior to ground disturbing activities, a qualified archaeologist shall conduct subsurface archaeological testing, site recording, and artefact recovery in previously undisturbed areas that would be significant impacted by project activities (e.g., grading deeper than 6 inches and drilling). The testing shall include a series of 50 cm shovel test pits at 10-meter (30-foot) intervals within the immediate areas that would be affected.	GDC	During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	Archaeological Monitoring. During grading activities, a qualified archaeologist monitor shall be present. The archaeological monitor shall observe grading activities and collect any artefacts that may be unsurfaced. If the archaeologist monitor determines that a sensitive archaeological site may be present, work shall be redirected until the site can be evaluated for its significance. If the site is determined to be significant or if the site evaluation efforts would be extensive, proposed project areas that pose a risk to the site may be relocated away from the site to avoid potential delays to project activities. Alternatively, special protection measures may be implemented to continue proposed project activities while preserving possible site features, as determined appropriate by the archaeological monitor.		
• Archaeological and Cultural Resources	**Cultural-2: Additional Pre-Construction Surveys in MS-202 and MS 205** The proponent shall conduct additional surveys for archaeological and cultural resources prior to civil work activities in MS 202 and MS 205. The proposed site MS 202 was found to have one grave, approximately 20m from the proposed well site. The survey would therefore be important to identify best locations for the well pads, ponds etc. This survey will also determine whether to relocate the proposed well site, relocate the grave, or re-planning of the arrangements of the drilling components such as well pad, ponds etc. Handling of grave will involve relevant stakeholders so as not to infringe on religious, traditional and cultural beliefs. Mitigation measure includes extensive consultation with the affected family, the community and the relevant church. If possible (since there is adequate uninhabited land around the proposed well site) re-engineering and slight relocation of proposed project component such as well pads, ponds and other components away from the grave. This would be the most recommended scenario that would include fencing-off and protecting the grave, and leave it undisturbed. If the grave is must be relocated, the proponent should follow all procedures for relocation of grave. Official notice is given to interested parties, it should be done: 1. With due regard to the views of the persons interested and the religious susceptibilities of the members of the religious community to which the person belonged whose grave or dead body it is; 2. In a manner which is not injurious to public health; 3. In accordance with such directions as may be given by the public officer appointed to supervise the undertaking; and 4. Accompanied by such religious rites or ceremonies as are appropriate to the religious community to which the person belonged whose dead body is removed. GDC should carry out consultative meetings with the affected people, families, religious institutions, and local authorities on modalities of grave relocation and taking into consideration laws on cultural preferences and wishes of families. GDC to consult with Ministry of	GDC	During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	Health, Internal Security as well as the County Government of Nakuru. The proposed site MS 205 was found to have place of worship just outside the proposed project perimeter. The layout of the proposed project site should consider the church. In addition, the proposed site covers a derelict quarry land. If any sensitive resources are discovered, the resources shall be evaluated to determine appropriate treatment or avoidance procedures. If the sites contain resources or if inadvertent discoveries are made during construction, the testing and monitoring provisions detailed in Cultural-1 shall be implemented, as determined necessary by the archaeologist and GDC.		
• Archaeological and Cultural Resources	**Cultural-3: Worker Cultural Resource Sensitivity Training** Workers shall be properly trained on identifying potential archaeological and cultural resources that could be uncovered during construction, including procedures for reporting potential discoveries to the archaeological monitor. If potential resources are discovered, they must be left in place or turned over to the archaeological monitor for proper record keeping and cataloguing.	• Civil Contractor/GDC • Drilling Contractor/GDC	• Before Construction • During Construction
VI. Landscape and Visual Character			
• Landscape and Visual Character • Waste	**Landscape-1: Site Reclamation and Restoration** The following reclamation and restoration activities shall be completed following construction: • Prior to construction, the contractor shall take photos of the well pad and access roads to document pre-construction conditions. • The contractor/GDC shall restore grades on site to match pre-construction conditions. • The proper restoration of the site shall be documented by the contractor in a post-construction report containing pre- and post-construction photos. • The drilling mud treatment facilities and water intake and/or drilling fluid disposal pipes shall be dismantled upon completion of the exploration phase and removed from the proposed project site. • Where applicable, the temporary treatment facilities and pipes for disposal of geothermal fluids produced during the well tests shall be dismantled after completion of the tests and the temporary treatment facilities and pipes shall be removed from the proposed project site. • The drilling fluid and mud reserve pits, and any water supply sumps shall be filled in, and graded to match the surrounding area. • The worker camp and storage area, including all aggregate and materials and any latrines, shall be	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	dismantled and removed from the site. The worker camp and storage area shall be resurfaced as necessary to match the surrounding area. • Heavily compacted areas should be appropriately de-compacted to facility quicker vegetation regrowth.		
VII. Traffic Circulation and Safety			
• Traffic Circulation • Community Health and Safety	**Traffic-1: Traffic Control** Informational signs shall be posted where lane and road closures could substantially disrupt traffic circulation at least 7 days prior to the closure. Proper traffic controls shall be in place during closures to minimize impacts on traffic circulation and for traffic safety, such as signs, flaggers, and temporary barriers. Local traffic laws and speed limits shall be followed at all times. Appropriate safety precautions shall be taken when transporting large equipment on public roadways, such as using a pilot car.	• Civil Contractor/GDC	• Before Construction • During Construction
• Community Health and Safety	**Traffic-2: Road Hazard Avoidance** If roadwork occurs on public roadways, the civil works contractor/GDC shall design the modifications in accordance with applicable road and traffic safety laws. The proposed project shall not degrade road safety or create a new road hazard. The designs for any road modifications shall be submitted to GDC for review and approval prior to conducting the work.	• Civil Contractor/GDC	• Before Construction • During Construction
VIII. Utilities and Communication Systems			
• Utilities and Communication Systems	**Utilities-1: Protect Overhead Utility Lines** The construction contractors/GDC shall identify and mark any overhead utility and communication lines that hang over access roads and work areas to ensure the lines are not inadvertently damaged during construction. A minimum of 5 feet of clearance shall be maintained between construction equipment and low-hanging lines. If the minimum clearance cannot be maintained, the construction contractors shall work with the applicable system providers to temporarily disconnect or reposition the lines for the duration of construction.	• Civil Contractor/GDC	• Before Construction • During Construction
IX. Hazards and Hazardous Materials			
• Water Quality • Hazardous Materials • Worker Health and Safety • Community Health and Safety	**Hazards-1: Hazardous Materials Management Plan** The construction contractors shall prepare and implement a Hazardous Materials Management Plan. The Hazardous Materials Management shall identify proper management procedures for all hazardous materials and wastes that may be encountered during construction, including handling, labelling, transporting, and storing procedures. In addition, the Hazardous Materials Management Plan shall address the following: • Non-toxic and biodegradable produces will be used whenever possible.	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	• Hazardous materials shall be transported and stored in appropriate containers with clearly visible labels. Hazardous materials shall be stored at least 100 feet from any down gradient drainage or within secondary containment cable of containing its entire volume. • Storm water flows shall be directed away from hazardous material storage areas. • Equipment and work areas shall be regularly inspected for signs of leaks and spills. Spill containment and clean-up kits shall be available wherever hazardous materials are being used or stored. Any incidental spills or leaks shall be contained and cleaned up as soon as it is safe to do so. Any contaminated soil shall be collected and disposed of in an appropriately. • Equipment refuelling and maintenance shall be limited to designated areas at least 30 meters (100 feet) from any down gradient drainage. All workers shall receive training on proper handling and storage of hazardous materials, as well as spill response and clean-up procedures, prior to working on the proposed project site.	•	
X. Fires			
• Wildfire Ignition	**Fires-1: Fire Prevention and Response** The risk of fires shall be evaluated for each proposed project site based on the activities that would occur, environmental conditions, and presence of ignitable or combustible materials in the area. If the activities pose a risk of igniting a wildfire, appropriate fire prevention and response equipment shall be available at each active site, such as shovels, axes, fire extinguishers, and dedicated water tanks. All workers shall be trained on proper fire prevention and response procedures prior to working on the site. Any smoking on site shall be restricted to barren areas away from ignitable or combustible material. Smoking waste shall be fully extinguished and disposed of appropriately.	Civil Contractor/GDC Drilling Contractor/GDC	• Before Construction • During Construction
XI. Solid Waste			

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Water Quality • Hazardous Materials • Waste	**Waste-1: Waste Management Plan** The construction contractors/GDC shall prepare and implement a Waste Management Plan. At a minimum, the plan shall address the sources of waste; waste minimization, reuse, and recycling opportunities; and waste collection, storage, and disposal procedures. The Waste Management Plan should distinguish between solid and liquid waste, as applicable, and include procedures for addressing waste that may be hazardous to health and the environment. In addition, the Waste Management Plan shall address the following: • All food waste shall be contained in covered bins and disposed of on a frequent basis to avoid attracting wildlife. • Trash bins shall be accessible at all locations where waste is generated. • The proposed project area shall be kept clean and free of litter and no litter shall be allowed to disperse to the surrounding area. • Solid waste shall be removed from the site and transported to a municipal dumpsite. • Waste shall not be dumped or buried in unauthorized areas or burned. • Human waste associated with the worker camp and latrines shall be properly contained and disposed of. The construction contractors/GDC shall ensure all workers receive training on proper disposal of all waste prior to working on the proposed project site.	• Drilling Contractor/GDC • Civil Contractor/GDC	• Before Construction • During Construction

8.3 SOCIAL MITIGATION MEASURES

Table 8-2: Social Mitigation Measures

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Livelihoods	**Social-1: Agriculture Production** Impacts to active farmland should be minimised to the extent possible. The locations of access roads and well pads should be positioned away from active agricultural areas, as feasible. The limits of all access roads and well pads shall be clearly identified and marked, if necessary, to ensure impacts from ground disturbance are limited to approved properties and work areas. The proposed water pipeline shall traverse some sections of farmland with variety of trees and crops. If active farmland cannot be avoided, trees/crops with long maturing periods (i.e., trees, bananas, mangoes, and citrus) should be avoided to the greatest extent possible. Where farmland and crops are impacted by the proposed project, farm owners and farmworkers should be compensated for the loss in pay and agriculture production for affected growing seasons in accordance with the RAP/LACP.	• Drilling Contractor/GDC • Civil Contractor/GDC	• During Construction
• Working Conditions and Equality	**Social-2: Working Conditions and Equality** Employment opportunities created by the proposed project shall be equally available to men and women. If locals are hired for construction jobs, job postings and/or notices shall be disseminated that foster participation from women and men. In consultation with GDC, and local administration, the contractors shall provide a preference for hiring from the project region in the civil works contract. However, the process must be depoliticised. The contractor should also have the final determination on the qualified workers for various tasks. The construction contractors/GDC shall provide safe and equal working conditions and comply with the World Bank's social policies regarding age, gender, ethnicity, and religious equality. Workers shall be provided with: • Information on their rights regarding safety and payment prior to working on the site • Gender-specific latrines at each project area that are maintained in a sanitary condition with adequate capacity • Gender-specific sleeping quarters at the worker camp • Clean drinking water at all times • Adequate training for their position Violence, sexual harassment, discrimination, and drug abuse shall not be tolerated. Workers engaging in such activities shall be dismissed immediately. Any concerns and complaints regarding workplace or	• Drilling Contractor/GDC • Civil Contractor/GDC	• During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	community harassment shall be addressed with respect and due diligence by a grievance and redress committee designated by the GDC; women shall be appointed to the grievance and redress committee. Workers and community members who issue concerns or complaints shall be protected from retaliation. Prior to working on the proposed project site, all workers shall receive equality and harassment awareness training, for both workplace and community relations, in conjunction with other social trainings for the project.		
• Working Conditions and Equality • Noise • Community Health and Safety	**Social-3: Community Engagement and Sensitivity** **Pre-construction Meeting.** Prior to the start of construction activities, the GDC- Project unit shall hold a public meeting for the affected communities to explain the proposed project activities, schedule, possible inconveniences that may be experienced during construction, and safety considerations associated with drilling operations (refer to Health and Safety-4). The affected communities shall be informed of how they can submit complaints about the project should they arise. **Informational Signs.** GDC shall install an informational sign at the entrance of each project site to inform the public about the proposed project, construction schedule, and important information about health and safety related to proposed project activities, such as evacuation areas in the event of an emergency. The sign shall include procedures and contact information for submitting complaints about the project to the community liaison officer. **Community Complaints.** Complaints that relate to the requirements set forth in the ESIA shall be recorded and addressed as set forth in the Stakeholder Engagement Plan, and the underlying issue shall be corrected, to the extent feasible. **Worker Sensitivity Training.** The contractor, in liaison with GDC shall prepare a social and community sensitivity training that would be provided to all workers. The training shall be designed to inform all workers of the local customs, traditions, and community considerations for each area affected by the proposed project. The construction contractors shall be responsible for providing the social and community sensitivity training to all workers prior to initiating work.	• GDC • Drilling Contractor • Civil Contractor •	• During Construction

8.4 HEALTH AND SAFETY MITIGATION MEASURES

Table 8-3: Health and Safety Mitigation Measures

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Fires • Worker Health and Safety • Community Health and Safety	**Safety-1: Health and Safety Plan** The construction contractors/GDC shall prepare and implement a Health and Safety Plan that addresses the applicable risks and prevention procedures applicable to each contractor's work. At a minimum, the Health and Safety Plan shall address hazards that may be encountered during construction, including prevention and response procedures, for the following topics: • General occupational hazards that may be encountered (e.g., moving machinery and motorized equipment, working at heights or in confined spaces, repetitive motions, falling objects, exposure to heat, loud noises, and hazardous materials, protective clothing); • Unique occupational hazards associated with drilling activities (e.g., exposure to potentially harmful geothermal gases, hot geothermal fluids and drilling materials, and hazards associated with a potential well blowout); • Minimum training requirements for operating vehicles, equipment, and machinery, in accordance with applicable laws and industry standards; • Fire prevention and response procedures, including compliance with the with relevant policies in Wildfire Management Plan; • Natural hazards that may be experienced during construction (e.g., storms, landslides, earthquakes, volcanic eruptions, and flooding), including designated response procedures and evacuation areas for each proposed project area that are consistent with the natural hazards and emergency response plans; • Biological hazards in the environment (e.g., dangerous or infectious insects, animals, and plants); • Disease risk and prevention (i.e., HIV/AIDs, etc.); • Community safety considerations (e.g., traffic, harmful geothermal gases, and unsafe areas); • Emergency preparedness and response procedures, including the locations of hospitals and medical services in the region in the event of an injury or medical emergency. • The construction contractors shall provide all workers with training on the contents of the Health and Safety Plan prior to working on the site. Refresher trainings shall be given on an occasional basis and before beginning work in new project areas.	• Drilling Contractor/GDC • Civil Contractor/GDC •	• Before Construction • During Construction

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
• Worker Health and Safety	**Safety-2: Personal Protective Equipment** The construction contractors/GDC shall supply all workers with personal protective equipment (PPE), and ensure workers use the proper PPE during all work activities. At a minimum, PPE for workers shall include: • Safety headgear • Steel toed boots • Safety glasses or impact-resistant eye protection • Ear protective devices • Harnesses for workers operating at heights • Respirators • Gloves • High visibility clothing or vests • Other specialized protective equipment for the drilling, welding, etc. All PPE shall be properly fitted for each worker, including body size and gender, and workers shall be trained in the proper use of PPE, prior to working on the proposed project site.		
• Worker Health and Safety	**Safety-3: First Aid and Emergency Response Equipment** The construction contractors/GDC shall provide first aid training to all workers prior to working on the proposed project. The construction contractors/GDC shall ensure all proposed project sites are equipped with first aid and emergency response equipment. The drilling contractor/GDC shall ensure that adequate safety equipment is located at drilling sites and maintained in good working order, such as firefighting equipment, protective suits, respirators, and other breathing apparatuses.	GDC	
• Community Health and Safety	**Safety-4: Community Safety** Communities that may be exposed to hazards from drilling activities (communities within 500 meters of well pads) shall be informed of the risks and provided information regarding emergency preparedness and response. If and where necessary at drilling areas, alarms shall be installed for major emergencies that could require evacuation, such as a well blowout or geothermal gas emission. Evacuation procedures during an alarm shall be communicated to community members during the Pre-construction Information	GDC	

Issues/Potential Impacts	Mitigation Measure	Responsible for Implementing	Timing of Requirements
	Meeting and on applicable display panels (refer to Social-3). The construction contractors/GDC shall install temporary signs and fences around all unsafe areas to prevent members of the public from entering the areas. If installing fences is not feasible, the area shall be clearly identified as unsafe with signs and flagging.		

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

This Environmental and Social Management Plan (ESMP) provides a logical framework within which the negative environmental and social impacts identified during the ESIA study can be mitigated and the positive impacts enhanced. Monitoring and management practices as well as monetary compensation are considered and cost estimates included. Responsibilities and time frames for the implementation of the various aspects of the ESMP have been identified.

This ESMP shall be made available both to the contractors and GDC to ensure that the environmental and social costs are factored into their costing. The contractor shall be required to come up with his own specific ESMP and work methods that will ensure safe construction of the proposed project ensuring compliance to applicable HSE legislations and standards

The proposed project proponent, GDC, will be mandated with the task of ensuring full compliance to the ESMP's provisions

9.2 Environmental and Social Management Plan

Table 9-1: ESMP Implementation Costs

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
A. MITIGATION MEASURES			All Cost in USD ($)			
• Water-1: Storm water, Erosion, and Sediment Control	Implement water quality procedures to prevent soil loss	• Install BMPs at start of civil works • Quarterly maintenance • Weekly inspection	1500	8000	5000	14,500
• Water-2: Water Quality Monitoring Program	Water quality testing and analysis before and during construction	• Assume monthly water quality testing and analysis in each area prior to and during drilling	10000		10000	20000
• Water-3: Drilling Waste and Effluent Management	Testing of drilling cuttings at each site	• Assumes analysis of up to 5 wells			10000	10000
• Water-4: Blowout Prevention	Use blow-out preventers	• Blow-out preventers on each well ($2,000 per well)			10000	10000
• Water-5: Water Supply System Protection	Repair water supply systems when damages are made	• Not anticipated			0	0
• Air-1: Fugitive Dust Management	Prevent fugitive dust through water application during ground disturbance and stabilizing disturbed areas	• Assume one water truck and locally sourced water would be used by the civil workers contractor for up to 90 days		20000		20000

[8] *Standard procedures and tasks that would be included with contractor construction contracts are identified in project mitigation measures and this table. Costs associated with these tasks are considered to be a standard construction cost and would not require additional funds associated with mitigation implementation.*

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
• Air-2: Construction Emissions Controls	Maintain and repair equipment according the manufacturer's standard	• N/A – Standard procedure		0		0
• Air-3: Air Quality Monitoring and Noxious Gas Management	Install gas detection and monitoring devices during well drilling and testing activities	• Up to 30 air tubes and air analysis over course of proposed project activities			10000	10000
• Soil-1: Topsoil Preservation and Restoration	Plastic sheeting to secure topsoil; reapply topsoil	• Equipment used to reapply topsoil would be available locally		500		500
• Soil-2: Geotechnical Investigation	Conduct geotechnical investigation prior to initiating civil works activities	• Geotechnical engineer		10000		10000
• Noise-1: Noise Abatement and Community Coordination	Install acoustic barriers between stationary equipment and sensitive receptors	• Up to 5 noise blankets			12000	12000
• Biodiversity: Invasive Weed Control	Clean work vehicles and equipment prior to entering the site	• N/A – Standard procedure				
• Biodiversity-3: Veg. protection, Nesting Bird Avoidance and Impact Minimization	Biologist survey and monitoring if necessary Possible implementation of visual and acoustic barriers Develop and implement an avifauna monitoring scheme, assessing bird population trends and direct hazards relating to the proposed project	• Cost for survey	2000	1000	1000	4000

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
• Cultural-1: Archaeological Testing or Monitoring • Cultureal-2: Preconstruction Surveys in MS-202 and MS-205 • Cultural-3: Worker Cultural Resource Sensitivity Training	Conduct surveys for archaeological and cultural resources prior to civil work activities Handling all culturally sensitive issues Provide archaeological and cultural resources training to workers	• Estimate includes testing and site visiting	10000			10000
• Landscape-1: Site Reclamation and Restoration	Dismantle temporary treatment facilities and worker camps	• One week to restore each drilling site			10000	10000
• Traffic-1: Traffic Control	Provide information signs where land and road closures could substantially disrupt traffic circulation	• N/A – Standard procedure				0
• Traffic-2: Road Hazard Avoidance	No cost associated with the measure	• No cost measure				0
• Utilities-1: Protect Overhead Utility Lines	No cost associated with the measure	• No cost measure				0
• Hazards-1: Hazardous Materials Management Plan	Use non-toxic and biodegradable drilling mud where feasible	• N/A – Standard procedure				0
	Embank reserve pits if drilling mud contains foams	• N/A – Standard procedure				0
	Install containment berms and redirect storm water flows around	• N/A – Part of construction				0

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
	hazardous material storage sites					
	Cap drilling mud determined to be toxic with clean fill materials	• Cost to import fill materials. Assumes 500 cubic meters of fill obtained from local quarry			5000	5000
• Fires-1: Fire Prevention and Response	Provide fire prevention and response equipment at each work site, such as shovels, axes, fire extinguishers, and dedicated water tanks	• N/A – Standard procedure				0
• Waste-1: Waste Management Plan	Prepare a Waste Management Plan for solid waste; store and dispose of solid waste at an appropriate designated	• Waste disposed weekly at a designated areas		800	1800	2600
• Social-1: Agriculture Production	Provide compensation for farmers where farmland and crops are impacted by the proposed project	• The loss of active agricultural production cannot be determined at this time. See LACP				0
• Social-2: Working Conditions and Equality	Provide information to workers regarding their rights on safety and payment; and provide training to workers for their position	• N/A – Standard procedure				0
• Social-3: Community Engagement and Sensitivity	Hold public meetings with the affected communities and install an informational sign at the entrance of each proposed project area and sites	• Assume a public meeting will be held with affected communities before construction occurs	5000	2000	2000	9000
• Social-4: Recreation	No cost associated with the measure	• No cost measure				

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
• Safety-1: Health and Safety Plan	Prepare and implement an EHS plan with all required elements	• Standard procedure for Civil contractor • Drilling contractor plan would include greater hazards, risk management strategies, and emergency response procedures		2000	4000	6000
• Safety-2: Personal Protective Equipment	Provide personal protective equipment	• N/A – Standard procedure				0
• Safety-3: First Aid and Emergency Response Equipment	Provide First Aid and safety equipment	• N/A – Standard procedure				
• Safety-4: Community Safety	No cost measure	• No cost measure				0
Mitigation Measures Subtotal (USD)			**18,500**	**44,300**	**80,800**	**143,600**
B. MONITORING						
• On-site Compliance Inspection and Monitoring	GDC Monitor – Inspect construction sites (approx. Weekly)	• Weekly GDC inspections during drilling and monthly during civil works • Contractor inspections would be conducted by staff present on the site (no cost)	25000			25000
• Reporting and Documentation	Prepare/review Pre- and Post-Construction Audit Reports, Monthly Compliance Reports, and Quarterly Monitoring Reports	• Prepare/review Pre-and Post-Construction Audit Reports, Monthly Compliance Reports, and Biannually Monitoring Reports	15000			15000
• Grievance and Redress Mechanisms	Redress grievances from community members, if needed	• Even though this will be within the normal duties of GDC, budget	10000			10000

Implementation Requirements	Requirements with Direct Costs	Assumptions8	GDC	Civil Works Contractor	Drilling Contractor	Req. Total
		should be factored in addressing grievances which may slow down or threaten the proposed project				
• Emergency Response/Clean-up Environmental	Respond to emergencies and clean up hazardous material spills, if needed	• No spills are anticipated				0
Monitoring Subtotal			**60,000**			**50,000**
ESMP PROJECT TOTAL			**78500**	**44,300**	**80,800**	**203,600**

10 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

10.1 Overview

Environmental monitoring is an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measures, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time.

10.2 ESMP Monitoring Plan

The Environmental and Social Management Plan will be subject to monitoring. The monitoring plan is complementary to the audits, inspections and reporting activities defined in the framework for implementation of the ESMP as summarized in the table below. The Table lists the related indicators, the items to be measured, the measurement frequency and the person/institution responsible and monitoring cost estimate.

Table 10-1: ESMP Monitoring Plan

Monitoring scope	Parameter	Indicator	Responsibilities		Project Phase	Monitoring Cost
			Monitoring Responsibility	frequency		
• Air Emissions and Air Quality Dust	TSP, SO_2, CO, H_2S, CO_2, CH_4 And Dust fallout etc.	• Bad odour; • Use of PPE; • H&S Plan in use; • Record of Induction for Workers • Active dust suppression	Civil Contractor Drilling Contractor GDC Monitoring team NEMA	Daily	•Civil works •Well Drilling •Geothermal Resource Testing	Included in Air Emission Control Management costs
• Impact on Flora (vegetation loss)	Visual inspection	• Bare soil; Soil erosion.	Civil Contractor, Drilling Contractor, GDC Monitoring team	Daily	•Site Development •Civil works	Included in Biodiversity Management Budget
• Noise	dB(A)	• Measure included in Design and Procurement plans • Hearing Protection and PPE in use • Record of Plant equipment maintenance	Civil Contractor, Drilling Contractor GDC Monitoring team	Daily	•Site Development •Civil Works •Well Drilling •Geothermal Resource Testing •Well Abandonment and Site Reclamation	Included in Noise Abatement and Community Coordination Management costs
• Occupational Safety and Health	Health and Safety records Visual inspection	• OHS Management system • Active and passive monitoring • Excellent workplace safety culture • Risk management	Civil Contractor, Drilling Contractor, GDC Monitoring team (Health Safety and Environment officer)	Daily	•Civil works •Well Drilling Geothermal Resource Testing	No additional cost. This is standard operation
• Protection of Ground Water Resources	Test of parameters such as pH, Oil and grease, Cadmium, Copper, Cyanide, Lead, Mercury, Zinc	• monthly water quality testing and analysis in each area prior to and during drilling • Testing of drilling cuttings at each site	Drilling Contractor, GDC Monitoring team WRMA	Monthly	•Well Drilling Geothermal Resource Testing •Well Abandonment and Site Reclamation (Decommissioning)	To be included in Water Quality Monitoring Program Management costs

• Public Awareness and Community Perceptions		• Availability of grievance management records • Evidence of Occurrence • Event Report	GDC Monitoring team (Community Liaison Officer)	Bi-weekly	• Site Development • Civil Works • Well Drilling • Geothermal Resource Testing • Well Abandonment and Site Reclamation	To be included grievance redress management costs
• Soil Erosion	Visual inspection	• Bare soil; • Soil pillars; • Cracks across the slope • Sediment fans	Civil Contractor, Drilling Contractor GDC Monitoring team	Weekly	• Site Development • Civil Works • Geothermal Resource Testing • Well Abandonment and Site Reclamation	To be included in Topsoil Preservation and Restoration management costs
• Solid waste management	Slag, domestic refuse, metallic scraps, sludge	• Documented approvals for placement of wastes • Comprehensive waste management plan	Civil Contractor, Drilling Contractor GDC Monitoring team	Daily	• Site Development • Civil Works • Well Drilling • Geothermal Resource Testing • Well Abandonment and Site Reclamation	Costs to be included in: i. Drilling Waste and Effluent Management ii. Waste Management Plan
• Storage of hazardous materials and chemicals	Spillages Visual inspection	• Adequacy of facilities for all Chemicals storage • Functioning storage containers • Chemical usage records	Civil Contractor, Drilling Contractor, GDC Monitoring team (Health Safety and Environment officer)	Monthly Audit Review	• Civil works • Well Drilling Geothermal Resource Testing	No cost. This is standard operation
• Traffic concerns	Visual inspection	• Prepare and implement Traffic Management Plan • Contractors' men shall be used to direct vehicle traffic around construction sites and hazards during working hours (Health and Safety Plan) • Availability of plans approved by Project Manager • Visible barriers and signage.	Civil Contractor, Drilling Contractor GDC Monitoring team	Daily	• Site Development • Civil Works • Supplies	No cost. This is standard operation.
• Water Quality (both surface and underground)	pH, BOD, Temperature, COD, Turbidity, Conductivity, Dissolved Oxygen, Nitrates	• Monitoring report; • Water quality report.	Drilling Contractor, GDC Monitoring team WRMA	monthly	• Well Drilling Geothermal Resource Testing • Well Abandonment and Site Reclamation (Decommissioning	To be included in Water Quality Monitoring Program management costs
• Worker and Public Safety	Visual inspection Incident and accident records	• Induction training • Safe working procedures • Shoring & appropriate precautions in place	Civil Contractor, Drilling Contractor, GDC Monitoring team (Health Safety and Environment officer)	Daily	• Civil works • Well Drilling • Geothermal Resource Testing	No cost. This is standard operation

10.3 ESMP Implementation Arrangement

All stakeholders should be involved in the implementation of this ESMP. The Stakeholder Engagement Plan (SEP) has been prepared as part of the set of outputs under the Environmental and Social Impact Assessment (ESIA) and annexed to this Report. (Appendix III).

The National Environment Management Authority (NEMA) Kenya is mandated to conduct its own independent monitoring of all projects based on the approval conditions for the ESIA, while The Bank will normally conduct bi-annual supervision mission to monitor compliance to the ESMP requirements.

10.4 Training and Capacity Development

The Proposed project shall undertake internal training and education activities to ensure that Proposed project expectations regarding environmental and social performance are achieved and maintain an ESMP training matrix as follows;

ESMP Induction Training and Awareness: this training should be for visitors or individuals who do not have direct roles or responsibilities for implementing the ESMP, and should cover basic Project environmental and social commitments.

ESMP Management Training and Awareness: this training focuses attention on management, covering key aspects of the ESMP and providing an overview of the Project's environmental and social impact management expectations and the supporting processes and procedures prescribed in the ESMS to meet performance expectations.

ESMP Job-specific Training and Awareness: job-specific training should be provided to all personnel who have direct roles and responsibilities for implementing or managing components of the ESMP. This training should also include all people whose specific work activities may have an environmental or social impact.

Onsite, these provisions and responsibilities should apply to all contractors and subcontractors. Those responsible for performing site inspections should receive training by drawing on external resources as necessary. Upon completion of training and once deemed competent by management, staff will be ready to train other people. The Project will require each contractor to institute training programmes for their personnel.

Estimated Budget for ESMP Implementation

To effectively implement the mitigation and monitoring measures recommended in the ESMP, a total estimated cost of **USD 203,600** (or KSh 20,360,000) has been proposed, exclusive of additional cost for Land Acquisition and Compensation Plan (LACP) and other costs to be included within the contractors costs for supervision. The cost of mitigation by the Civil works and Drilling Contractors shall be included in the contract as part of the project implementation cost.

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

All impacts associated with the proposed project could be avoided or mitigated by implementing the mitigation measures identified in this ESIA. The proponent will comply with all national and international policies, including the World Bank's Environmental and Social Policy for Investment Project Financing and Environmental and Social Standards (ESS) through implementation of the mitigation measures listed in Table 8-1, Table 8-2 and Table 8-3.

In general, the proposed project is first step towards securing green emery to the country. If successful, it will lead to appreciable benefits to the country power production and create opportunities for both social and economic development.

Public consultations revealed that the local communities have high socioeconomic interests and many expectations from GDC. The proposed project activities (both civil works and wells drilling) are not expected to strain existing water supplies by NAWASCO in the proposed project areas, as GDC would supply water to the proposed project sites.

11.2 Recommendations

- It is recommended that GDC develop and implement a community liaison strategy with proper communication and feedback mechanism; and a clear all community concerns as soon as they arise. The liaison staff should also be tasked to manage the local community expectations (through well- structured community SEP) by providing the correct position of the proposed project.

- The proposed ESMP should be adhered to the latter. GDC should regularly provide close monitoring to ensure that the contractors implement the plan, as scheduled.

- All stakeholders should be encouraged to participate in the implementation of ESMP. For instance GDC, and the WRA should undertake joint studies to investigate any possibility contamination of underground water aquifers (either through thermal or chemically) and institute appropriate mitigations where necessary.

- Ensure compliance with NEMA approval conditions throughout the proposed project phases;

- Ensure compliance with the MOUs (agreements the communities, WRA, KFS, other interest parties) throughout the phases of the proposed project to ensure smooth proposed project implementation.

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13 APPENDICES

13.1 Key Informant Interview Guide

SECTIONA: INTRODUCTION

Consent: We, ***Log Associates***, have been contracted by the **Geothermal Development Company (GDC), Kenya** to conduct an **Environmental & Social Impact Assessment Study for Menengai West Geothermal Drilling Project.** The Geothermal Development Company is mandated with development of 5000MW of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospects across the Kenyan Rift. The Greater Menengai geothermal project is among the more than 14 high temperature geothermal areas within the Kenyan Rift being developed by GDC for geothermal energy utilization. The Menengai West geothermal prospect is located west of the Menengai caldera. Geoscientific surveys including geology, geochemistry and geophysics were carried out GDC where five (5) exploration wells were sited. Results indicate that Menengai West prospect may be hosting a high temperature geothermal system. Drilling in this field is scheduled to commence soon.

In developing the ESIA Study Report, we are mandated to engage in consultations /interviews with various stakeholders both at the National and County levels to get their views on the same and also collect their latest published data where applicable. We would kindly request you to have an interactive discussion with us on the same. Your contribution will help us identify direct and indirect potential project impacts (negative and positive) expected from project implementation.

SECTION B: KEY QUESTIONS FOR EACH STAKEHOLDER

1. Nakuru County Governor

i). Project area background

ii). Working environment with GDC

iii). Electricity penetration in the county

iv). Area social economic activities

v). Viable alternatives of economic activities in the area

vi). Level of security in the project area

vii). Proposed project impacts on the socioeconomic activities in the area

viii). Proposed mitigation measures

2. Nakuru County Commissioner

i). Project area background
ii). Working environment with GDC
iii). Electricity penetration in the county
iv). Area social economic activities
v). Viable alternatives of economic activities in the area
vi). Level of security in the project area
vii). Proposed project impacts on the socioeconomic activities in the area
viii). Institutions within the project area (socio amenities, schools, business premises)
ix). Proposed mitigation measures

3. Deputy County Governor

i). Project area background
ii). Working environment with GDC
iii). Electricity penetration in the county
iv). Area social economic activities
v). Viable alternatives of economic activities in the area
vi). Level of security in the project area
vii). Proposed project impacts on the socioeconomic activities in the area
viii). Institutions within the project area (socio amenities, schools, business premises)
ix). Proposed mitigation measures

4. Deputy County Commissioner

i). Project area background
ii). Working environment with GDC
iii). Electricity penetration in the county
iv). Area social economic activities
v). Viable alternatives of economic activities in the area
vi). Level of security in the project area
vii). Proposed project impacts on the socioeconomic activities in the area
viii). Institutions within the project area (socio amenities, schools, business premises)
ix). Proposed mitigation measures

5. Nakuru County Executive Environment

i. Level of Environmental conservation in the area
ii. Extent of Environmental degradation in the area
iii. Impacts of the proposed project on environment
iv. Main water sources in the project area
v. Main energy sources used by the people of the County and especially in the project area
vi. Any previous impacts to the environment as a result of geothermal activity in the County
vii. Working environment with GDC
viii. Socio economic issues affecting environmental management in the project area
ix. Mitigation measures taken against these impacts
x. Any environmental concerns for the project

6. Nakuru County Department of Water, Environment, Energy and Natural Resources

i. Level of Environmental conservation in the area
ii. Extent of Environmental degradation in the area
iii. Impacts of the proposed project on environment
iv. Main water sources in the project area
v. Main energy sources used by the people of the County and especially in the project area
vi. Any previous impacts to the environment as a result of geothermal activity in the County
vii. Working environment with GDC
viii. Socio economic issues affecting environmental management in the project area
ix. Mitigation measures taken against these impacts
x. Any environmental concerns for the project

7. Nakuru County Department of Agriculture, Livestock, Fisheries and Cooperatives

i). Types of crops grown (subsistence and cash crops)
ii). Methods of farming used
iii). Likely impacts of the proposed project on farming in the area
iv). Proposed mitigation measures
v). Livestock found in the area
vi). Possible impacts of the project on livestock production
vii). Likely impacts of the project on meat production
viii). Likely impacts of the project on dairy production
ix). Likely impacts of the project on range management
x). Proposed mitigation measures

8. Nakuru County Officer of Culture

i). Areas of heritage likely to be affected by the project
ii). Working environment with GDC
iii). Likely impacts on those areas
iv). Proposed mitigation measures

9. Nakuru County Environmental Officer (National Environment Management Authority)

i). Level of environmental conservation in the area
ii). Extent of environmental degradation in the area
iii). Socio economic issues affecting environmental management in the project area
iv). Impacts of the proposed project on environment
v). Working environment with GDC
vi). Proposed mitigation measures

10. Menengai West Drilling Project Manager

i. Potential sources of noise
ii. Proposed project technologies
iii. Potential air emissions
iv. Water requirements for the project
v. Potential impacts to soil cover and water sources
vi. Likelihood of landslides as a result of drilling

11. Kenya Wildlife Service (KWS)

i). Animal species in the project area

ii). Bird species in the project area

iii). Anticipated impacts of the project on the animal/bird species in the area

iv). Working environment with GDC

v). Possible projects impact

vi). Proposed mitigation measures

vii). Kindly share the flora and fauna survey reports around Menengai West (Include Birds survey report)

12. Kenya Forest Services (KFS)

i). Tree species in the project area

ii). Endangered species in the area

iii). Likely impacts of the project on the tree species in the project area

iv). Possible project impacts

v). Working environment with GDC

vi). Mitigation measures for the impacts

vii). Kindly share a documentation of the existing tree species around Menengai West (Include both exotic and indigenous)

13. Department of Mines and Geology Kenya

i). What is your mandate in relation to Mines and Geology in Kenya?

ii). Types of minerals available in the proposed project area

iii). Specific areas where minerals deposits are likely to be found within the proposed project area

iv). Challenges associated with mineral deposits during construction of geothermal projects

v). What measures are you taking to ensure protection of mines and minerals in this area

14. Water Resources Authority (WRA)

i). Water sources are available in the area

- Groundwater sources
- Surface water sources

ii). Likely impacts of the project on

- Groundwater sources
- Surface water sources

iii). Likely impacts of the project on water quality in the area

iv). Existing reports on ground water mapping around Menengai West

v). Proposed mitigation measures

15. Non-Governmental Organizations

i). Social, political and economic challenges in the project area

ii). Impacts of the project in the area

iii). Working environment with GDC

iv). Proposed mitigation measures for those impacts

13.2 Public Participation Guide

SECTION A: INTRODUCTION

Thank you for consenting to the meeting. We are a team from Log Associates. We have been contracted by the **Geothermal Development Company (GDC)** to conduct an **Environmental & Social Impact Assessment Study for Menengai West Geothermal Drilling Project.** Your contribution will help us identify direct and indirect potential project impacts (negative and positive) expected from project implementation.

SECTION B: CONSULANT GUIDE BRRIEF

The consultant brief will highlight:

- Why we have to conduct an ESIA (legal and policy requirement)
- Project activities expected (GDC may have covered part of this)
- Anticipated benefits
- Mitigation of negative impacts
- Role of the community and stakeholders throughout the project cycle
- Need for open and positive engagements with the consultant and GDC

SECTION C: PARTICIPANTS' COMMENTS GUIDE.

1. Extent of knowledge about the project
2. Concerns or reservations they have about the project on: -
    - Land
    - Livestock
    - Forests
    - Wildlife
    - Water sources
    - Natural Habitats
    - Local communities
    - Others (Specify)
3. Socio-economic activities in the region
4. Anticipated project benefits to the community/viable economic activities on the affected area
5. Physical and Social amenities in the area likely to be affected by the project implementation
6. Community views and complaints regarding the project
7. Envisaged projects impacts (On Environment)
8. Proposed mitigation measures
9. Suggestions on a way forward for the smooth implementation of the project

SECTION D: VOTE OF THANKS

13.3 Household Questionnaire

Questionnaire No. | | | |

SECTION A INTRODUCTION

Hello. My name is [ ]. I am working with Log Associates Limited. We have been subcontracted by the **Geothermal Development Company (GDC) to conduct an Environmental & Social Impact Assessment Study for Menengai West Geothermal Drilling Project.** This study will help us obtain information that will be used to identify potential socioeconomic impacts of the proposed project.

Name of Respondent ..... County _____

Respondent Contact ..... Sub-county _____

Respondent ID No. ..... Division _____

Date of Interview ..... Location _____

Name of Interviewer ..... Sub Location _____

Supervisor _____ Village .....

(***NOTE:*** *This questionnaire shall be administered only to the household head or any other responsible adult person in the household at the time of the survey)*

SECTION B DEMOGRAPHIC DATA

B1	***B2***	***B3***	***B4***	***B5***	***B6***
Sex of respondent 1. Male 2. Female	How old are you (yrs)? 1. < 18 yrs 2. 18 – 25 yrs 3. 26 – 35 yrs 4. 36 – 45 yrs 5. 46 – 60yrs 6. Above 60 yrs	What is your marital status? 1. Married (No. of Spouses) 2. Widowed 3. Divorced 4. Separated 5. Never Married (99) Others(Specify)	Do you have any children under the age of 18 yrs? 1. Yes 2. No **>>B6**	If yes, how many?	What is the highest level of education you attained? 1. Pre-primary 2. Primary 3. Secondary 4. College 5. University 6. Never Attended (99) Others (Specify)

B7	***B8***	***B9***	
How long does it take to get to the nearest school? 1. < 20 minutes 2. 21 – 40 minutes 3. 41 – 60 minutes 4. Over 1 hour	What type of house you dwell in? 1. Permanent 2. Semi-Permanent 3. Temporary	What materials have you used to build the house?	
		Walls 1. Wood & mud 2. Stones & mud 3. Stones & cement 4. Cement blocks 5. Wood poles 6. Bricks (99) Others (Specify)	**Roof** 1. Mud 2. Thatch 3. Iron Sheet 4. Tin 5. Poles 6. Polythene 7. No roof (99) Others (Specify)

SECTION C HEALTH AND VULNERABILITY

C1	C2	C3	C4	C5
How long does it take to get to the nearest health centre? 1. < 20 minutes 2. 21 – 40 minutes 3. 41 – 60 minutes 4. Over 1 hour	Do you have any member of your household who is disabled? 1. Yes 2. No	What is the nature of disability? 1. Lame 2. Blind 3. Deaf 4. Dumb 5. Crippled 6. Crossed eyes 99. Others	Has any member of your household been ill within the last four months? 1. Yes 2. No	If yes, what is/was the member suffering from? 1. Malaria 2. Flu/Cough 3. Stomach disorders 4. Diarrhoea 5. Cholera 6. Headaches 7. Chronic Illness 8. Other (Specify)

NB:-Chronic illnesses include Ulcers, Sickle Cells, Cancer, Diabetes, Asthma, High Blood Pressure, Tuberculosis, and HIV/AIDS.

SECTION D WATER & SANITATION

D1	*D2*	*D3*	*D4*
What is your ***main*** source of water for domestic use? 1. Dam 2. Water pans 3. Piped water supply 4. Boreholes 5. River/Stream 6. Shallow Well 7. Water Kiosks (99) Other(Specify)	How long does it take to get to the nearest water source from your homestead? 1. < 20 minutes 2. 21 – 40 minutes 3. 41 – 60 minutes 4. Over 1 hour	How do you ensure water for household use is safe? 1. Boiling 2. Filtering 3. Decanting 4. Use of Chemicals 99. Others	Do you have a toilet within your compound? 1. Yes 2. No>>>D6

D5	*D6*
If Yes in D4 above, what type is it? 1. VIP latrine 2. Simple latrine 3. Flush toilet 99. Others	If No how do you dispose of human waste? 1. Neighbours Toilet 2. Bush 3. Burying within compound 99 Others

SECTION E INCOME & LIVELIHOOD

E1	*E2*	*E3*	*E4*
Do you own any land? 1. Yes 2. No>>>>E3	If Yes, what is the size? 1. < 1 acres 2. 1 - 2.5 acres 3. 2.6 – 4 acres 4. 4.1 – 5 acres 5. Above 5 acres	What is your main source of income? 1. Crop Farming 2. Livestock keeping 3. Bee Keeping 4. Poultry Farming 5. Formal Employment 6. Charcoal production 7. Trading/Businessman (Specify)	Name any other income generating activities practiced.

E4	***E5***		***E6***		***E7***
Do you practice crop farming? 1. Yes 2. No>>>E7	If Yes, which crops do you cultivate?		How much do you get per acre/annum?		Do you practice animal farming? 1. Yes 2. No
	Cassava		Cassava		
	Millet		Millet		
	Sorghum		Sorghum		
	Maize		Maize		
	Onions		Onions		
	Beans		Beans		
	Vegetables		Vegetables		
	Tomatoes		Tomatoes		
	Others		Others		

E8		***E9***
If Yes, which animals do you keep?		What is the nature of your business?
Goats		
Sheep		
Cattle		
Carmel		
Poultry		
Others		

F: ASSETS- LAND OWNERSHIP

F1	F2	F3	F4	F5	F6
Which of your assets are affected 1. None 2. Land >> **F2** 3. Structure(s) >>**G1** 4. Crops/Trees>>**H1** 5. Grave/Cultural site 6. Others (Specify)	For the affected land do you have proof of Ownership? 1. Yes>>**F3** 2. No	If yes in E2, which one? 1. Title deed 2. Allotment letter 3. Other, Specify	Which type of ownership is your land under? 1. Leasehold 2. Freehold 3. Trust land 4. Squatter	What is the size of your Land and when did you acquire?	How did you acquire this property? 1. Buying 2. Inherited 3. Gift 4. Rented 5. Other (Specify)

F7	F8	F9	F10	F11	F12
How do you use your land? 1. Crop Farming 2. Livestock Keeping 3. Sanctuary 4. Other Uses (specify)	What non-farm activities do you conduct on your land? 1. Quarry 2. Mining 3. Other (Specify)	If affected, can you relocate within your plot (if settlement land) or outside the way leave trace (If trust land)? 1. Yes 2. No	To the best of your knowledge, does this land have any caveats or under any form of dispute? 1. Yes>>**F11** 2. No >>**F12**	Explain the existing caveats or dispute	Do you or any of the affected families on this plot have other land holding nearby or elsewhere? 1. Yes>>**F14** 2. No>>**G1**

F13	F14	F15	F16

If yes, where?	Estimated total size (*Acres*)	Land Type 1. Settlement 2. Trust	Nature occupancy 1. Land owner 2. Tenant 3. Co-owner 4. Co-tenant 5. Licensee 6. Renter 3. Squatter

SECTION G: ASSETS- STRUCTURES

G1	G2	G3
Which of your structures is affected? 1. None 2. Main House 3. Kitchen 4. Latrine 5. Dish Rack 6. Fence 7. Granary/Store 8. Business premise 9. Tank 10. Well 11. Others (Specify)	How did you acquire this property? 1. Buying 2. Constructed 3. Inherited 4. Gift 5. Rented 6. Other (Specify)	Nature of the affected structure 1. Permanent 2. Semi-permanent 3. Temporary
Structure Affected	**How It Was Acquired**	**Nature**

SECTION H: ASSETS- TREES AND CROPS

H1	H2	H3			H4
Which of your plants are affected? 1. Trees>>**H2** 2. Crops>>**H5** 3. Others (Specify)	Which of your trees are affected? 1. Exotic 2. Indigenous 3. Both Exotic and Indigenous 4. Fruit 5. Others (Specify)	What is the Number, Type and Size of your affected trees?			Why do you own these trees? 1. Source of Income 2. Prestige 3. Environmental Conservation 4. All the above 5. Others (Specify)
		Number	**Type**	**Size (S, M, L)**	

N/B: Size of Trees is either Small (S), Medium (M) or Large (L)

H5	H6	H7

<table>
<tr><td>What kinds of your Crops are affected?

1. Food crops
2. Pasture
3. Cash crop
4. Others (Specify)</td><td>What is the Number, Type and Size of your affected Crops?<table><tr><th>Number</th><th>Type</th><th>Size (Area)</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td><td>Why do you own these Crops?
1. Source of Income
2. Source of food
3. Animal feeds
4. All the above
5. Others (Specify)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">H9</td></tr>
<tr><td colspan="3">Which are the common types of tree species within the area? Kindly tick those affected within the project within your area.</td></tr>
<tr><td colspan="3"><table><tr><th>Local Name</th><th>Scientific Name</th><th>Affected (Tick theaffected)</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td></tr>
</table>

SECTION I: SOCIAL STRUCTURES

I1	I2
Which of these Public facilities are you closest to? 1. Primary School 2. Secondary School 3. Health Centre 4. Road 5. Water Source/Point 6. Historical Sites 7. Others (Specify)	Distance to public facility? 1. < 500m 2. 501m to 1 km 3. 1-2 km 4. 2-3 km 5. 3-5 km 6. More than 5 km
Public Facility	**Distance**

SECTION J:

Comments: ……

……..

……..

……..

THE END

THANK YOU FOR YOUR TIME

13.4 List of Key Stakeholders Consulted

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Key Informant Interview List

No.	Name	Designation	ID No.	Contacts	Signature
1.	ERICK KORIR	D.G.			
2.	JOASH KIPROTICH	P.A. D.G.		0718512243	
3.	John S Kiptoo	ACC I	11166436	0721820747	
4.	Daisy Maina	Environment officer - Nema	24002296	0722618191	
5.	Grace Kirui	CDA	1801633	0722595598	
6.	FREDRICK O.U. OWINO	COUNTY CROPS DEV OFFICER	7039844	0710467777	
7.	Joseph Kimaru	County Animal Production Officer	21346225	0334[illegible]	
8.	Patrick N. Kinyanjui	CADO	11046891	0722676858	
9.	Clare Obora	Administrator Youth & Sports	24272522	0722221341	
10.	J. M. KAVITA	DEC Rongai	8846236	0728874344	
11.	ABDIR G. DIBA	ACC - Kampi ya Moto Division	27698779	0727560857	
12.	Catherine Wambani	Senior Warden	7991269	0722255532	
13.	Simiyan Kioko	Tourism Warden	9073818	0736617422	

Key Informant Interview List

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Key Informant Interview List

No.	Name	Designation	ID No.	Contacts	Signature
1.	EVELYN SILABI	ART	11574783	eveesilabi@gmail.com	
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					

Key Informant Interview List

13.5 Minutes of Consultative Meetings

13.5.1 Minutes of meeting held at Chief's Camp Ol' Rongai

Minutes of meeting held at Chief's Camp Ol' Rongai on Tuesday 30 October, 2018 from 10:30 am – 12: 00 noon

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/2018: Opening Remarks

The meeting was called to order by the Chief, Mr. Ruben Omondi at 10:30 am and was opened by a word of prayer by a Ramadhan Ali. The Chief later introduced his two assistants Betty J. Lagat and Isiah O. Auko before calling on the consultant to address the members. The figure below shows a section of members of public who were in attendance.

Plate 12.1 Ol' Rongai Chief's Camp Public Consultation Meeting

Min 2/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/2018: Concerns, comments and questions from the community members

Knowledge of the Project

The consultant explained to the community where the proposed project area stood. After elaboration from the consultant, the members understood what the project was all about.

Envisaged project benefits

The community appreciated that the project would boost the level of development in the area (improved roads) and provides employment opportunities.

Envisaged negative impacts

Environmental pollution in the form of noise resulting from construction activities would occur. Moreover, diseases and injuries would be caused by dusts and flying rock fragments emanating from the project sites during construction. Excavation activities would cause open pits that pose a safety hazard especially at night.

Proposed Mitigation Measures

Safety gear should be provided to the community members who will be employed on site to minimize the occurrence of injury incidences. A mobile clinic should be set-up at the project sites to treat medical emergencies and injuries immediately.

The community will liaise hand in hand with the contractors / proponent at all stages of the project.

Compensation

The community asked for adequate compensation for the loss of their grazing land. Adequate compensation will be required for the structures that would be demolished to pave way for the project. The Community also requested for compensation of trees that will be cut during construction.. Unskilled employment opportunities should be reserved for community members.

Corporate Social Responsibility

As part of GDC's Corporate Social Responsibility efforts, community members recommended that water projects such as boreholes be constructed to serve the area. They recommended for improvement of existing roads, schools and dispensaries.

Summary of the key issues discusses:

Name	Question /Concern	Consultant's Remarks
Joseph Mosop	Kindly explain why this project is different from the one GDC has been doing. We have representatives selected by GDC, what is different in this project?	This a new proposed project located on the western side of the Menengai Caldera. It is yet to begin. The project is new and different from the previous project on the Menengai Caldera hence the need for the ESIA Study. The representatives selected were for the existing Caldera project.
Jeremiah Goff	GDC had promised five (5) years ago to fence Ol' Rongai dispensary in their previous meetings, however, this has not yet been done.	GDC has a team in place that sees through all issues relating to CSR activities. Some promises take longer than others. However, there are representative from the community and GDC who follow up

Name	Question /Concern	Consultant's Remarks
	Why does GDC wish to start a new project before meeting their previous promises?	on those issues. These questions will be better answered in your future engagements with GDC as the meetings fall part of their stakeholder's engagement plan. The new project is part of GDC's mandated to ensure that by 2030, the country's vision of having 5,000MW is realised.
Cornelius Nyambuki (Previous Chairman for Ol'Rongai Dispensary)	We are grateful for the new project. However, most of the promises we made in the 1st ESIA have not been met. We have the power to stop further engagement with GDC is our promises are not met. I agree on the new project but we need a hearing of the 1st promises made to GDC. Majority of our people are yet to get employment.	
Waweru Nyangi	According to the Petroleum bill, 2017 the county is entitles to 25% share of the revenue generated. Can this be applicable here? Our previous promises to get water, polytechnics, jobs etc. have not been met by GDC. What's the way forward?	The bill has clearly stated in section 85 (2) that the county government's share shall be equivalent twenty percent of the national government's share provided that the amount allocated does not exceed the amount allocated to the county government by Parliament in that financial year. Section 85 (3) stupilates that local community's share shall be equivalent to five percent of the Government's share and shall be payable to a trust fund managed by a board of trustees established by the county government in consultation with the local community provided that the amount allocated does not exceed one-quarter of the amount allocated to the county government by Parliament in that financial year under consideration. Question on employment has been

Name	Question /Concern	Consultant's Remarks
		answered.
Kepha Osuru (Raymond Moi's Representative)	GDC has failed us, our youths have not been employed, and our initial agreements have not been implemented. We cannot have a new project before this are met.	Question was left for future meetings. *(However, GDC clarified of this issue later in a meeting held at Chief's Camp Ol' Rongai on Tuesday 9 November, 2018 from 10:00 am – 2: 00 pm at the members were in agreement on the way forward)*
Jackson Kimeli	We need some explanations from GDC on promises from the 1st project. We need to select representatives to push forward for a meeting with GDC on their earlier promises.	
David Muita	GDC requested us names, qualifications among other things to get employment but up to date we haven't heard from them. We even gave KSh. 100 per person to take to GDC for approval but nothing happened. We even went to Naivasha ate the whole day but thereafter we could only secure jobs for security. We have even gone to Merica Hotel in Nakuru and got some stipend but nothing much was done. I hope this new project will be different from the previous one.	

Name	Question /Concern	Consultant's Remarks
Henry Jakaya	GDC promised 200 bags of cement to Ol'Rongai secondary school. But his has not yet been received.	
Lidia Komen	We had been advised to select 35 youths in from Rongai to be employed by GDC though the Lavington tender, however, none of them has been employed yet.	
Geoffrey Onyango	GDC has done so much for Bahati residents. They sank 7 wells in Bahati, yet the Menengai Caldera is on our side.	
Margaret Mosop	We have boys who are qualified tractor drivers; however, most people employed by GDC are not from our side. Will the new project be different?	
Daniel Lowoi	The SACCO through which GDC uses to solicit for employees is run by cartels. We have even tried to stop the SACCO in Ol'Rongai. We don't see dividends. Yes WE WANT the PROJECT but GDC should address this issues 1st.	
Kepha Osuru (Raymond Moi's Representative)	We agree with the consultant. We need the new project. However, we need GDC on ground to explain their previous promises to us. GDC should work with community and local leaders	We are grateful for your participation and representation. I truly agree that you need to have more engagements with GDC so that we call all have a smooth journey towards implementation of this new proposed Menengai West Drilling Project.

Min 3/4/2014: A.O.B

The community recommended for the formation of a committee to follow up on issues relation to the current and previous promise they had with GDC.

Adjournment

The meeting was adjourned with vote of thanks from the Mr. Cornelius Nyambuki, the chief and the consultant. The meeting closed with a word of prayer from a Henry Jakaya. The list of attendance is attached here in below.

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/10/2018 Time: 10:30 Venue: 2pm CHIEFS CAMP OL-RONGAI

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Reuben D. Omondi	OL-Rongai	7953152	0721321051	
2.	ISAIAH O. AUKO	BARINA	11716168	0710905220	
3.	BETTY J. LAGAT	MENENGAI	21250639	0721343[illegible]	
4.	Wawerw Nyonji	"	70024[illegible]	0722602[illegible]	
5.	Stephen E Namoni	"	3553454	0721652[illegible]	
6.	John Mainge	"	[illegible]29567	0727170[illegible]	
7.	Geoffrey Onyango	"	21031643	0728152754	
8.	Jeremiah N. Njoroge	"	12786225	0724291638	
9.	George Mwaura	"	8576441	0725297[illegible]	
10.	ROY K. KIPTANUI	"	9778696	0722785260	
11.	George N. Gitau	"	30832[illegible]	0725439[illegible]	
12.	EMMICE[illegible]NGOM	MENENGAI	30244076	0717570913	

THE CHIEF DAT 30/10/18 OL-RONGAI LOCATION

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	Maureen Kibet	Ol-Rongai	29767058	0708413834	
14.	JANE CHEPYEGON	ol-rongai	10051988	0721561205	
15.	DAVID	"	27043915	0701860916	
16.	PHILIP SIROR	OL-RONGAI	33021354	0705672350	
17.	David Lanegat	"	4268424	0713025974	
18.	Arap Bor	"			
19.	Wilfred Lochuch	OL-RONGAI	32122174	0797374835	
20.	STANLEY KORIO	ol-Rongai	30852448	0726002408	
21.	KIPTARUS KURUI	OL-RONGAI	5985657	"	KURUI
22..	PETER OTIENO	OL-RONGAI	2237797	0729191617	
23.	ANTON NJOROGE	OL RONGAI	9835240	—	
24.	ANN CHEPKWONY	OLRONGAI	7156445	0710958850	
25.	Hosea Kosgei	OL-Rongai	31996850	0798692803	
26.	Jackson Kiprotich	Ol-Rongai	13952723	0722365776	

THE CHIEF OL-RONGAI LOCATION DATE 30/10/18

Public Participation Attendance List
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Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/1/2018 Time: 10:30 AM Venue: 01 - Rongai - Chief Place (Ca

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Jackson Kimeli	OL-Rongai	2315559	0722644399	
2.	David C. Mwila	OLRONGAI	0284832	0728483 2	
3.	JOHN KAMAU	OL RONGAI	8281947	0722287691	
4.	ARTHUR NDEGE	OL- RONGAI	6329168	0722-272779	
5.	Joseph [illegible]	ol Rongai			
6.	John Kibaara	ol Rongai			
7.	Ibrahim				
8.	Jane Muchemi	ol rongai	21960227	0713296141	
9.	Margaret MOSOP	OL Rongai	7679572	0718137035	
10.	Margaret Mbogwo	OL Ronga	2312490	0727205567	
11.	Jamal Ndungu	OL.Rongai	23411881	0729322433	
12.	CHRISTINE SOI	OL RONGAI	0854704	0720254[illegible]	

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	LUSIA AKAL	OL RONGAI	35229753	0790437409	
14.	IAPSAPEO ORENGO	OL RONGAI	0872077		
15.	JOYCE ANYANGO	OL- RONGAI	27570148	0745 756 892	
16.	Penine Kinyo	OL Rongai	28805589	0718957600	
17.	Esther Orege	OL RONGAI			
18.	Amos NYORORGE	OL RONGAI	27835CH	0716910075	
19.	Joshua Omkweny0	OL Rongai	04627723	0727838998	JOSHUA
20.	Chimant Otieno	OL Rongai	26447448	0705871905	
21.	George Bett	OL Rongai	29526587	0799296900	
22..	Ann Nyambura	OL Rongai	3626067	0726847024	
23.	Martin Macharia	OL Rongai	20130796	0735117161	
24.	Morin AChieng	OL Rongai	31394557	0728583542	
25.	Lydia Korner	OL-RONGAI	35560G1	0720235289	
26.					

Public Participation Attendance List
Page 2 of 2

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/10/2018 Time: 10:30 Venue: 2 pm CHIGES CAMP OL-RONGAI

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Cornelius Nyambok	OL-RONGAI	1687870		
2.	SAMUEL MUCHIRI	"	7149367		
3.	[illegible] Mbuki	"	20587785		
4.	paul [illegible]	"	13122788		
5.	Paul Mwangi	"	20804905		
6.	SETH. O' MOMANYI	"	13622393		
7.	James Ndungu	"	2341181		
8.	Margaret MOSOP	"	7699572		
9.	Margaret MBOGWA	"	23124790		
10.	MICHAEL KIPRO	"	25384809		
11.	Alfred KIPTOO		12935597		
12.	RICHARD KOECH		26108393		

THE CHIEF DATE 30/10/18 OL-RONGAI LOCATION

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	DANIEL LOWOI	OLRONGAI	27629605	0718025951	
14.	[illegible]	OL-RONGAI	21617572	0722976040	
15.	RAMADHAN A. ALI	"	13537671	0723 041386	
16.	ESTHER KABUE	OL-RONGAI	4271137	0729551583	ESTHER
17.	MARY WAKIMU	OL-RONGAI			MARY
18.	[illegible]	OLRONGAI	30775427	0707717985	
19.	MATOMAYE CHEPKOI	OL-RONGAI	22436596	0723776222	
20.	ANNAH WAKIMU	OL-RONGAI	8238502	0715 793127	ANNA
21.	PRISCA KIZITO	OL-RONGAI			PRISICA
22..	JENNIFER ACHUNGWA	OL-RONGAI	52491263	0729297645	
23.	GRACE JERUTO	OL-RONGAI	—	—	GRACE
24.	MOSES KAMAU	OL-RONGAI	29437223	0724 777509	
25.	Sheikh Akinu	OL-RONGAI	30126400	0715 [illegible]	
26.	[illegible] Mwaura	OL Rongai			

Public Participation Attendance List
Page 2 of 2

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/10/2018 Time: 10:30 PM Venue: 2PM CHIEFS CAMP OL-RONGAI

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	RICHARD KIPTOO	OL-RONGAI	20576698	0727777325	
2.	JAMES GOLOLICH	OL-RONGAI	11804466	0725548308	
3.	EBASTUS MUTANGO	OL-RONGAI	13/27765	0720514251	
4.	ERICK KIACHIRA	OL-Rongai	13128211	0707346277	
5.	PETER NDUNGU	OL-RONGAI	7763592	0731647880	
6.	JAMES K. KIPTOON	OL-RONGAI	22505562	0717502175	
7.	HENRY CHEMAYA	OL-RONGAI	6848225	0720656212	
8.	Stephen Mutai	OL-RONGAI	0999619	0722253088	
9.	Mworoge Gitau	OL RONGAI			
10.	DM [illegible]	0710728296			
11.	Francis Ngange	OL RONGAI	11420120	0720[illegible]	
12.	Joseph Rotich	OL Rongai		0793	

THE CHIEF DATE 30/10/18 OL-RONGAI LOCATION

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	Hosea Ko	Ol-Rongai	—	—	
14.	BENSON NGUGI	Ol Rongai	-	—	
15.	Joseph Kiprotich	"	"	-	
16.					
17.					
18.					
19.					
20.					
21.					
22..					
23.					
24.					
25.					
26.					

THE CHIEF DATE 30/10/18 RONGAI LOCATION

Public Participation Attendance List
Page 2 of 2

13.5.2 Minutes of meeting held at Rigogo Center (Kirima Sub Location)

Minutes of meeting held at Rigogo Center on Tuesday 30 October, 2018 from 2:30 pm – 4:30 pm

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/2018: Opening Remarks

The meeting was called to order by the Chief, Mrs. Esther N. Milgo at 2:30 pm and was opened by a word of prayer by Joseph Kiunjuri. The Chief later introduced consultant to address the members. The figure below shows a section of members of public who were in attendance.

Plate 12.2 Rigogo Center (Kirima Sub Location) Public Consultation Meeting

Min 2/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/2018: Concerns, comments and questions from the community members

Knowledge of the Project

The consultant explained to the community where the proposed project area stood. After elaboration from the consultant, the members understood what the project was all about.

Envisaged project benefits

The community appreciated that the project would boost the level of development in the area (improved roads) and provides employment opportunities.

Envisaged negative impacts

Environmental pollution in the form of noise resulting from construction activities would occur. Moreover, diseases and injuries would be caused by dusts and flying rock fragments emanating from the project sites during construction. Excavation activities would cause open pits that pose a safety hazard especially at night.

Proposed Mitigation Measures

Safety gear should be provided to the community members who will be employed on site to minimize the occurrence of injury incidences. A mobile clinic should be set-up at the project sites to treat medical emergencies and injuries immediately.

The community will liaise hand in hand with the contractors / proponent at all stages of the project.

Compensation

The community asked for adequate compensation for the loss of their grazing land. Adequate compensation will be required for the structures that would be demolished to pave way for the project. The Community also requested for compensation of trees that will be cut during construction. Unskilled employment opportunities should be reserved for community members.

Corporate Social Responsibility

As part of GDC's Corporate Social Responsibility efforts, community members recommended that water projects such as boreholes be constructed to serve the area. They recommended for improvement of existing roads, schools and dispensaries.

Summary of the key issues discusses:

Name	Question /Concern	Consultant's Remarks
Elijah Wachira	Early before GDC came, our iron sheets had not rusted. Geothermal activities within the Menengai Caldera which is just adjusted to us releases some salty water. Is it for this reason that our iron sheets are rusting? We don't have enough classes in Rigogo secondary school. GDC had promised to assist in our previous engagements but this has not been fulfilled. So far, we have only been given short	There have been rumors that the reasons for rusting iron sheets are brought about by the activities of GDC in the Caldera. However, this cannot be true since GDC carries out annual audit of its activities and the concentrations of H_2S among other parameters measured around the surrounding locations. However, the tests have proved that the gasses released from the activities in the caldera are permissible and up to standard. GDC in future engagements since with the community will answer the question about short term

Name	Question /Concern	Consultant's Remarks
	terms jobs. I have a driver's license with an experience of 5 years; can I get a job with GDC?	employment and who to employ. However, for any project of this nature, there will be opportunities for both skilled and non-skilled. It is however not possible for GDC to employ everyone in the village. GDC has its own policies and structures set to guide the process of selecting employees.
Fransis Chege	We appreciate for your coming. WE WANT DEVELOPMENT. Some of us may be affected directly with the project and even forced to relocate. How will you compensate?	The process of compensation in very engaging and starts during the RAP. The proponent (GDC) will either lease, or compensate fully in cases where it's deemed necessary. The whole idea of compensation will be to make your life far much better that what it was before. We will use the current land rates in the area and incases of misunderstanding, a grievance redress mechanism will be used. A RAP committee will also be selected to oversee the proses. Some of the representatives will come from within the community.
Benson Waweru	We appreciate and welcome the new project. However, GDC promised a lot of things five years ago i.e. promised water, electricity, education and hospital. We are yet to see any of these. The jobs we get are just for 3 months before we get '*retrenched*'.	The issue of CSR activities is currently been looked at by GDC are there are people solely responsible for such issues in GDC. The Menengai West Project is new but your previous concerns and questions on previous promises will be answered in your future engagements with GDC. In most cases, the CSR issues are usually priority based and it's usually not

Name	Question /Concern	Consultant's Remarks
	Does GDC have a say in the government?	possible to do all of the at once. GDC is a government entity, yes they have a say in the government.
Mungai Wachira	We only saw trees been given in 2011, up to date, we haven't seen anything.	
Elijah Wachira	We have registered a youth group known as Rogogo Bidii Youth Group; can GDC give us a contract to help plant trees?	
Area Chief (Mrs. Esther N. Milgo)	The MP for Bahati knows how to get his things done. He makes sure his people are employed in GDC all the way from Wanyororo, however, in Kilima Sub Location none has been employed yet. I only do recommendations for small jobs e.g. watchmen. GDC employed people from very far, we need our people to get places of employment too. Only one lady from Kilima sub location has been employed and this is because she passed as a resident of Ol'Rongai. We have to share employment opportunities; however WE ACCEPT this project but GDC should help look through the issues of employment.	
Bilha Amenda	We are just a fraction of the	You are good news ambassadors.

Name	Question /Concern	Consultant's Remarks
	community, this information need to be told to everyone. How will that be possible? Our boys only get small jobs like a watchman who only lasts to just 3 months. GDC Promised us trees but we were never given. If the project has negative effects on our health, we will be affected and have nowhere to go.	What you hear today, kindly share with a friend or two. We gave enough notice for more than 7 days to convene this meeting and even if we try again, some people may never show up. Therefore today and the days that follow, let us all inform our good friends and neighbor whom for one reason or the other failed to show up here. The issues of employment are well articulated in GDC's policies and governed by a SEP. In your future engagements, GDC will be able to inform you on the issues of trees. Currently, we have not heard on any major effect of the project gasses on individuals. Tests are run annually and none have every come out negative.
Daniel Ndegwa	We started similar projects on tree planting but we haven't seen any help. Our environment has changed even though scientists say everything is okay.	
Joseph Macharia	Our health is deteriorating. We go to hospitals and the doctors give as prescriptions but we don't have move to buy the meds.	
Moses Kinyua	I came along time ago; this place was purely green with a lot of grass. I cannot sleep without meds, feels like some form of dust in my chest.	It has been all over our televisions and newspapers that the issue of climate change has really hit the country. African picture on the globe 20 years ago looks so different from what we see today. The issue of climate change is common and should not be mistaken for the activities in the caldera otherwise;

Name	Question /Concern	Consultant's Remarks
	There was famine in the year 2002 but only survived because of this grass. What if it strikes today?	previous test on GDC would have failed. *When the respondent was asked what he was diagnosed from, he couldn't tell.*

Min 3/4/2014: A.O.B

The consultant mentioned that the event was part of full ESIA study and that the consultant would incorporate issues discussed in the full ESIA study report.

Adjournment

The meeting was adjourned with vote of thanks from the chief and the consultant. The meeting closed with a word of prayer from Daniel Ndegwa. The list of attendance is attached here in below

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/10/2018 Time: @ 1430Hrs Venue: RIGOGO CENTRE, Kirima Sub lo

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	ESTHER N. MILGO	KIRIMA SNR A/CHIEF	9554002	0720818591	
2.	BILLIAH NYOMENDA	KIRIMA Nyumba Kumi Leader	33289499	0713074099	
3.	ALIMA AKITELA EKALI	KIRIMA	5987181	0718228934	
4.	LIDIA NYAGOTHI	RIGOGO	21793864	0726457382	
5.	Zachariah Gukume	RIGOGO	7401323	0722614446	
6.	ESTHER N. WACHIRA	RIGOGO	21002135	0705747163	
7.	LUCY NJERI	RIGOGO	-	-	
8.	MARY NYAMBURA	RIGOGO			
9.	VIOLET WANJIRU	RIGOGO	11117223	0710899561	
10.	Ngugi Kanagi	RIGOGO	3300061	0724306984	
11.	MWANGI MAHOI	RIGOGO	1054393	0728762606	
12.	DANIEL M. MBEGWA	RIGOGO	0805702	0723882902	

ASSISTANT CHIEF KIRIMA SUB-LOCATION P. O. Box 21, BAHATI

Public Participation Attendance List
Page 1 of 2

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 30/10/2018 Time: 1430Hrs Venue: RIGOGO CENTRE, Kirima Sub location

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	ESTHER N. MILGO	KIRIMA SNR A/CHIEF	9554002	0720818571	
2.	BILLIAH NYOMENDA	KIRIMA Nyumba Kumi Leader	13328949	0713074099	
3.	ALIMA AKITELA EKALI	KIRIMA	5987181	0718228934	
4.	LIDIA NYAGOTHI	RIGOGO	21793964	0726437383	
5.	Zachariah Gathuma	RIGOGO	7401323	0723611404	
6.	ESTHER N. WACHIRA	RIGOGO	21002135	0705747163	
7.	LUCY NJERI	RIGOGO	-	-	
8.	MARY NYAMBURA	RIGOGO			
9.	VIOLET WANJIRU	RIGOGO	11117223	0710899561	
10.	Ngugi Kanagi	RIGOGO	3300061	0724306984	
11.	MWANGI MAIHOI	RIGOGO	1054393	0728762606	
12.	DANIEL M. MBEGWA	RIGOGO	0805702	0723882902	

Confirmed ASSISTANT CHIEF KIRIMA SUB-LOCATION P.O. Box 21, BAHATI

Public Participation Attendance List
Page 1 of 2

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	Joseph christopher machana	Ricogo	0325892	0700544764	
14.	JOHN KARURA THUKU	Rigogo	12853567	0723	
15.	PETER MBUCHA KAMAU	RIGOGO	7852656	0712	
16.	JOSEPH K. KUNYURI	Rigogo	1252349	0724	
17.	BENSON WANJERU KABARU	Mon'gu	0332424	0712	
18.	ELIJAH WACHIRA NJAHUTHU	Rigogo	10543870	0711	
19.	Simon ngige Kungu	Rigogo		0712	
20.	Francis Macharia Mwangi	Rigogo	4269996	0720293406	
21.	Stephen N. Wanjeru	Rigogo	0330153	0767	
22..	JOEL KUNGU GITHUA	Rigogo	7183508	0712	
23.	STEPHEN MWANIA	Richoko	6200119	0713896860	
24.	JAMES WACHIRA KIAH	Richoko	2961415	0726	
25.	Peter Karani	Ricoco	24965501	0724	
26.	Samuel Mutiga	Kiriima	0228252	0722	

Confirmed ASSISTANT CHIEF

Public Participation Attendance List
Page 2 of 2

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 3/10/2018 Time: 1430HRS Venue: RIGOGO CENTRE – Kiamina Sub location

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Stephen muriithi	Rigogo	3590483	0726910344	
2.	NELSON GACHIE	Rigogo	21050917	0702224666	
3.	Daniel Kamau	Rigogo		07 - -	
4.	PAUL NJUNGI	RIGOGO	23039409	0729462644	
5.	Kigotho MAINA	RIGOGO	10272391	0714515062	
6.	ZAKARIA OMWANZA	RIGOGO	0332143	—	
7.	Josphat MJOGU MAINA	Rigogo	6103725	0714855945	
8.	Daniel Thuku Muriithi	Rigogo	9373719	0726778130	
9.	STANLEY MUNGAI	Rigogo	6060701	0713758144	
10.	John Karanja	Rigogo	21590907	0722802451	
11.	Stephen Muiruri	Rigogo	4838953	0725822821	
12.	John Wahunga	Rigogo	25565794	0710767148	

ASSISTANT CHIEF KIAMINA SUB-LOCATION P.O. Box 21, 8...

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	PETER IRUNGU	RIGOGO	—	—	
14.	JOSPHAT MURAGE	RIGOGO	23348875	0719136092	
15.	KANINI KEIRO	RIGOGO	—	—	
16.	SIMON NGIGE	RIGOGO		0711257119	
17.	PRISCAH KERUBO	KIRIMA	10156435	0720961329	
18.	EVERLINE KITUR	KIRIMA	10156435	0720961329	
19.	ESTHER WAMBUI	RIGOGO	13451708	0728795811	
20.	KIRITU KAGURE	RIGOGO			
21.	[illegible]	RIGOGO	5986[illegible]4	0725[illegible]9140	
22..	STEPHEN NJUGUNA	Rigogo	30226484	0708137941	
23.	SAMUEL MWANGI	RIGOGO	—	—	
24.	JEFFERSON MILGO	KIRIMA	23382970	0729418474	
25.	STEPHEN KIMENTO	RIGOGO	8[illegible]550556	0721381[illegible]	
26.					

Public Participation Attendance List
Page 2 of 2

13.5.3 Minutes of meeting held at the Kampi ya Moto DCC's camp

Minutes of meeting held at Kampi ya Moto DCC's camp on Thursday 1 November, 2018 from 10:30 am – 12:00 noon

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/07/2018: Opening Remarks

The meeting was called to order by the Chief, Mr. John Chepyegon at 10:30 AM. A word of prayer was then offered by a Gabriel Muaga. After brief introduction of the purpose of the meeting, Chief Chepyegon called on the consultant to address the members. The photos below show a section of members of public who were in attendance.

Plate 12.3 DCC's Camp Kampi ya Moto Public Consultation Meeting

Min 2/07/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/07/2018:: Concerns, comments and questions from the community members

Knowledge of the Project

The consultant explained to the community where the proposed project area stood. After elaboration from the consultant, the members understood what the project was all about.

Envisaged project benefits

The community appreciated that the project would boost the level of development in the area (improved roads) and provides employment opportunities.

Envisaged negative impacts

Environmental pollution in the form of noise resulting from construction activities would occur. Moreover, diseases and injuries would be caused by dusts and flying rock fragments emanating from the project sites during construction. Excavation activities would cause open pits that pose a safety hazard especially at night.

Proposed Mitigation Measures

Safety gear should be provided to the community members who will be employed on site to minimize the occurrence of injury incidences. A mobile clinic should be set-up at the project sites to treat medical emergencies and injuries immediately.

The community will liaise hand in hand with the contractors / proponent at all stages of the project.

Compensation

The community asked for adequate compensation for the loss of their grazing land. Adequate compensation will be required for the structures that would be demolished to pave way for the project. The Community also requested for compensation of trees that will be cut during construction. Unskilled employment opportunities should be reserved for community members.

Corporate Social Responsibility

As part of GDC's Corporate Social Responsibility efforts, community members recommended that water projects such as boreholes be constructed to serve the area. They recommended for improvement of existing roads, schools and dispensaries.

Table 13-1: Summary of the key issues discusses

Name	Question /Concern	Consultant's Remarks
Margret Lowoi	In 2014, GDC told us to join and form women groups in Menengai West, Soin and Bahati. We are still in darkness on what transpired after that. We are not close the geothermal plant. GDC came and left us as we are. Our major worries include; Water problems There are no hospitals around despite our high population The issue of employment has not been dealt with properly at all.	GDC has a team in place that sees through all issues relating to CSR activities. Some promises take longer than others. However, there are representative from the community and GDC who follow up on those issues. These questions will be better answered in your future engagements with GDC as the meetings fall part of their stakeholder's engagement plan. There have been rumors that the reasons for health issues are brought about by the activities of GDC in the Caldera. However, this cannot be true since GDC carries out annual audit of its activities and the concentrations of H_2S among other parameters measured around the surrounding locations. However, the tests have proved that the gasses released from the activities in the caldera are permissible and up to standard.
Patrick Ndichu (Assistant Chief)	GDC promised trees but has not provided Promised to make hospitals but none has been put up There is no power in Morop, Rajuera, Niceway, Mainga and Kampi ya Moto settlement Scheme. Give employment to youths. The selection criteria should be clear.	

Name	Question /Concern	Consultant's Remarks
	Subukia people are benefiting more than us GDC promise roads and employment but none has been provided so far GDC should upgrade the Kampi ya Moto ro Rongai road	
John Cheroitich (Kalasinga)	I agree with the chief, GDC promised so much but nothing happened We want jobs All the promises went to Bahati Maybe we should protest like Lordwar and Turkana to get things done GDC should not promise what they can't deliver; however, we really want the new project.	
Patrick Nderitu	We need to know the associated risks and harm from the project. (sulphur content) so that we don't regret later. GDC promised jobs which never came We really need a hospital	
Jopheth Morogo	You have said GDC want to start new explorations, we cannot disagree The initial project promised water up to that for irrigation but didn't mature The issue of youth employment is still wanting 75% of employment in previous project went to Bahati, we hope this is now for us. I hope the issues we discuss, will all be recorded If you need youths, let youths nominate themselves GDC promised to put us a district hospital, however this has not yet been met Our roads are poor even though this was promised before	
Joseph Mutua	We are very happy to see consultants but we hope this is not just a PR GDC should really work on their CSR activities, not to promise what they won't	

Name	Question /Concern	Consultant's Remarks
	provide They even promised progress reports on CRS activities but we haven't received any We used to graze our cattle on GDC land, nowadays it's impossible GDC should give something back even if it's just grass. We've only seen people doing bails of grass on GDC land but we know none of them If we are minority, we still deserve equal rights	
Gabriel Munga Mutungure	There is so much activities on power project around yet we don't have power Our grass is no-longer green. We think it's because of geothermal gasses. The place is too cold, we need a hospital GDC should ensure at least 70% of our youths are employed If you don't take our issues to GDC no need of this meeting	
Samson Cheriot	GDC employs people from far yet we have qualified drivers, corruption is the main problem We have no power and water	
Jessica Chemuto	Ensure transparency in employment GDC told us to form groups but they didn't work though it was very expensive forming them We welcome the new project but we need to have measures of ensuring GDC goes by their promises	
Julius Loskiria	Issue of employment for the youths should be encouraged We need not have so many young boys and girls around our villages everyday GDC promised a hospital, if they can deliver this, we will be happy.	

Min 4/07/2018: A.O.B

The consultant mentioned that the event was just an ESIA study and later on other issues such as identification of PAPs and compensation would take place.

Adjournment

The meeting was adjourned with vote of thanks from the chief and the consultant. The meeting closed with a word of prayer from a Joseph Mutua. The list of attendance is attached here in below.

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 1/11/2018 Time: 11:00AM Venue: Kampi ya Moto

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	ABDUL G DIBA	ACC-KAMPI YA MOTO	27698778	0727860857	
2.	VIOLA YEGO	SCO RONGAI	20070124514	0720850969	
3.	GLADYS KIGEN	ASST. CHIEF	24541395	0727146050	
4.	JOHN CHEPYEGON	CHIEF	12439130	0724012310	
5.	PATRICK MBUGUA	K/CHIEF	14069048	0722947062	
6.	JOSEPH W. MUIRUA	K/MOTO P.A K/Moto Pr.	21007776	0722956599	
7.	GABRIEL MULUNGA	K/MOTO SCHEME	23153397	0722947526	
8.	FRANCIS KAMJA	K/MOTO RANJUERA	2322811	0717038485	
9.	JULIUS LOSIKIRIA	K/MOTO RANJUERA	0875444	0727457557	
10.	SHADRACK CHERUIYOT	MOROP FARM	24902885	0720227626	
11.	IKURUGAT SITENEI	IKARYTO FARM	23230944	0729370229	
12.	Vincent Kimutai	SCHEME	33026639	0716904250	

CHIEF'S OFFICE KAMPI YA MOTO LOCATION TEL:0724 [illegible] 110 Date..... Sign.....

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	NEWTON MAINA	K/MOTO	30862538	0724648248	
14.	SAMUEL KIMANI	K/MOTO	29400509	0714808790	
15.	PATRICK NDERITU	K/MOTO	29265763	0720771623	
16.	Sammy cheye	K/MOTO	36035145	0712000501	
17.	GEOFFREY WAMERE	K/MOTO	36057663	0703945313	
18.	Duncan Kariuki	K/moto	29400248	0712320431	
19.	Boscon MURithi	11	33153467	0722706893	
20.	Jamil Hassan	K/mutto	35427116	0798772216	
21.	PETER KARANJA	K/Moto	26502516	0713922360	
22..	Millicent Cheboi	K/MOTO	30596059	0728633616	
23.	Kennedy Sowe	K/MOTO	32904089	0715652910	
24.	JOSEPH LOROT	KMOTO	13130415	0726282149	
25.	JOHN EKENO	LORTUMOE	23189495		
26.	JACKLINE CHEPNGETICH	K/moto	35867924	0795213961	

CHIEF'S OFFICE
SAMPLYA MOTONGONYON
TEL: 0720 [illegible]
Date..... Sign.....

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 1/11/2018 Time: 11:00AM Venue: Kampi ya Moto

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	JOHN CHERUTICH (KAKASHOSA)	K/MOTO	4547218	0722289593	
2.	SHARON JERUTO SENEI	K/MOTO	26396087	0728639588	
3.	Julia Tallam	MOROP Farm	3302203	07/6003904	
4.	Stela Chebii	K/MOTO	25445051	0724386745	
5.	KOLLY CHESEREK	K. MOTO	1844539	0728	
6.	JANET. NIMBONE.	K. MOTO	7891978	0718855280	
7.	JANE. Wangare Mwangi	K/MOTO	3627020		
8.	KOBILO KIPKORIR	K. MOTO	3626072		
9.	JESSEAH KENUNTO	K/MOTO	3326066	0725	
10.	Paulina Chele.	K/ Moto.	03366		
11.	Esther Jatoiyai Kipkus	K/ Moto	4552		
12.	APAI MAUDO.	K/ Moto	—		

CHIEF'S OFFICE KAMPI YA MOTO LOCATION TEL:07 110

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	Kachagose. Kadeli.	Kl/ Mata	4789253	—	
14.	EKIRU. IEKUTAN. LEMU	K./ Mata	4233552	—	
15.	Lakui Lopelast	Kl/ mata	4798902	—	
16.	ANNA WACHAM.	K./ mata	—	—	
17.	Naomi Wanjiku.	Kl/ Mata	2333214	0724674422	
18.	MARY Wanjiku Mango	Kl/ mata.	—		MARY
19.	MARGARET Wanjiru Kinuthia	Kl/ Mata	6632063	0720746807	
20.	gerekin. chelangat	Kl/ mata	2324333	0719166186	
21.	Cherato Kosikei	Kl/ Mata	—	—	
22..	ANNA Koichi	Kl./ Mata	—	—	
23.	ESTHER CHEMTAI	Kl/ mata	6352772	—	—
24.	Grace. TAPTUE	Kl/ mata.	2344630	—	
25.	Paul. cheptanin.	Kl/ Mata	0233976	0797584488	
26.	ESTHER. RUTHE..	Kl/ Mata	—	—	

CHIEF'S OFFICE
KAMPI YA MOTO LOCATION
TEL: 0722 110
Date..... Sign.....

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 1/11/2018 Time: 11:00 AM Venue: Kampi ya Moto

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	ROSEMARY MWANGI	KI/ Mako	5927861	0719042599	
2.	Veronica W. Kimani		2330133	0219584244	
3.	Tarbenga Cheplakwa.	KI/ Mako	2753363	0746182488	
4.	Gratiani Gathera	KI/ Mako	23121564	—	
5.	Hannah Cherop	KI/ Mako	36226223	—	
6.	Joshua Robogon	KI/ Mako	46218085	—	
7.	Paulina Barongo	KI/ Mako	—	—	
8.	Rael. Sige Rono	KI/ Mako	59878944	—	
9.	Esther Muyanga	KI/ Mako	—	—	
10.	John Chir Chir	KI/ Mako	11291325	0715690711	
11.	Agnes Cheruto Chegor	KI/ Mako	31097321	0710711339	
12.	Tego Gathani	KI/ Mako	05X216		

CHIEF'S OFFICE
KAMPI YA MOTO LOCATION
TEL: 0726 [illegible] 310
Date ..... Sign .....

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	VERONICA N. MBURU	K/moto	36279775	0711884755	
14.	AMANIKOR LOKULAS	K/moto	31038909		
15.	APEGRE Rhoda.	K/moto	429072	—	
16.	ABIEMWA IEKwani	K/moto	28876644	—	
17.					
18.					
19.					
20.					
21.					
22..					
23.					
24.					
25.					
26.					

Public Participation Attendance List
Page 2 of 2

CHIEF'S OFFICE
SANPI YA MOTO LOCATION
TEL:0724 012 310
Date..... Sig.....

13.5.4 Minutes of meeting held at Maciaro

Minutes of meeting held for Maciaro/ Valley on Wednesday 31 October, 2018 from 2:30 pm – 4:30 pm

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/07/2018: Opening Remarks

The meeting was called to order by the Chief, Mr. Simon K. Ndegwa and Evans M Ongeri at 2:30 pm. Chief Mr. Ongeri called on the consultant to address the members. The photos below show the members in attendance.

Plate 12.4 Maciaro/ Valley Public Consultation Meeting

Min 2/07/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/07/2018:: Concerns, comments and questions from the community members

Knowledge of the Project

The consultant explained to the community where the proposed project area stood. After elaboration from the consultant, the members understood what the project was all about.

Envisaged project benefits

The community appreciated that the project would boost the level of development in the area (improved roads) and provides employment opportunities.

Envisaged negative impacts

Environmental pollution in the form of noise resulting from construction activities would occur. Moreover, diseases and injuries would be caused by dusts and flying rock fragments emanating from the project sites during construction. Excavation activities would cause open pits that pose a safety hazard especially at night.

Proposed Mitigation Measures

Safety gear should be provided to the community members who will be employed on site to minimize the occurrence of injury incidences. A mobile clinic should be set-up at the project sites to treat medical emergencies and injuries immediately.

The community will liaise hand in hand with the contractors / proponent at all stages of the project.

Compensation

The community asked for adequate compensation for the loss of their grazing land. Adequate compensation will be required for the structures that would be demolished to pave way for the project. The Community also requested for compensation of trees that will be cut during construction. Unskilled employment opportunities should be reserved for community members.

Corporate Social Responsibility

As part of GDC's Corporate Social Responsibility efforts, community members recommended that water projects such as boreholes be constructed to serve the area. They recommended for improvement of existing roads, schools and dispensaries.

Summary of the key issues discusses:

Name	Question /Concern	Consultant's Remarks
Mungai Ayub	If asked as communities of Maciaro, we have heard problems with GDC over the last five years; we were promised water jobs etc. but this were not offered. We have worked for GDC in some instances; we got pay delays for a period of 2-3 months. This was even made worse when our engagements were terminated after 3 months. We also need long term jobs. We have certificates and we qualify.	GDC has a team in place that sees through all issues relating to CSR activities. Some promises take longer than others. However, there are representative from the community and GDC who follow up on those issues. These questions will be better answered in your future engagements with GDC as the meetings fall part of their stakeholder's engagement plan. There have been rumors that the reasons for rusting iron sheets are brought about by the activities of

Name	Question /Concern	Consultant's Remarks
	Our major concer in WATER. We really need water. The county government of Nakuru gave us a take and it was for GDC to supply it with water but this did not last for long. We need GDC to talk to us on their previous promises, the SACCO are no longer beneficial. Only two guys residing in our immediate community (Martin Thiong'o and George Ngera) got employment by GDC. Martin's case was just by chance. GDC should come clear on issues of employment so that we don't have very high hopes.	GDC in the Caldera. However, this cannot be true since GDC carries out annual audit of its activities and the concentrations of H_2S among other parameters measured around the surrounding locations. However, the tests have proved that the gasses released from the activities in the caldera are permissible and up to standard.
Fransis Mureu	Consultations on geothermal power for the Caldera started from KENGEN. They promised employment for the locals but this did not come through. The SACCO is a complete let down We don't have elections for SACCO	

Name	Question /Concern	Consultant's Remarks
	leadership, the SACCO was supposed to be for people ages 18 – 35 but now, older guys are a majority. If I reside here in Maciaro and took my ID from Nakuru town, does that mean I am not entitled to employment as a local? How can we fix this? I propose GDC should give Maciaro and Valley employment slots in even numbers i.e. 2, 4, 6 etc.so that in any instance a member is picked from either side. We have skilled people, Quantum had advertised for a Chief Accountant but we didn't get that slot. We want WATER and EMPLOYMENT. Kindly share a copy of the minutes with us. One guy in our location wanted to plant trees in to locations. Why not give him the contact to plant or hire him to water trees.	
Hellen Wanjiku Ngeu	GDC are our friends but have failed our promised.	

Name	Question /Concern	Consultant's Remarks
	The project started with KENGEN before GDC took over. Bahati residents are the most employed. The county government provided us with a water tank but we still don't have water up to date. GDC was supposed to supply us with water through the tank. We went with Mr. Mureithi to be shown proposed roads that would be constructed by GDC. However, this is yet to be done. Kindly rehabilitate our roads. Our 3years old 7,000 liters tank has no water. If GDC could supply water even twice a week, we would be very greatful. GDC should consider the gender rule to ensure more women are employed as this is not the case.	
Jeremiah Mathenge	I do support all the talks. GDC came and asked for our papers	

Name	Question /Concern	Consultant's Remarks
	and qualifications but none has ever benefited. Through the SACCO, we were able to get employment but since Menengai west is so big we hardly get any of those positions Since my stay here form 1985, I think the project has affected my health Our jobs are contractual; you get stopped without prior warning. When we ask GDC for water, they tell us to address them to NAWASCO. We are told to follow proposal from the SACCOs to get employment. We were only able to get two people to be employed in GDC just because we demonstrated. The criteria of picking even numbers say 2, 4, 6 etc. is very good.	
Ayubu Mungai	We know those without work here, it's because of the SACOOs we don't get employed.	

Name	Question /Concern	Consultant's Remarks
	GDC should come on ground and explain this issues We have fought; the people in Bahati have water unlike us.	
Anthony Geshine	We have a common rivalry with people in Mercy Njeri, kindly don't put us together. We need our own SACCO here. The smell from geothermal gasses is not good. Our major issue is WATER.	
Anna Njeri Gitau	Every day we see GDC vehicles transporting people from far to this Caldera. We a left only to witness, yet we are very close to it. Can't we be given priority?	
Priscilla Wambui Gathuthi	Ann Njeri has a point, we all need jobs. Will GDC replace our iron-sheets.	
Mike Kirui	We thank our visitor and welcome them. I have been told that GDC has tried more explorations in Bahati but failed. Now, they have come to Menengai	

Name	Question /Concern	Consultant's Remarks
	West How comes our youth are not employed? GDC has selected people from Mercy Njeri, now, we need people employed from here. The wells must benefit us. We are the major stakeholders. The SACCO is not properly ran. GDC promised two classes in Maciaro, even promised water but this didn't materialize. We want GDC to come and explain all this.	

Min 4/07/2014: A.O.B

The consultant mentioned that the event was just an ESIA study and later on other issues such as identification of PAPs and compensation would take place.

Adjournment

The meeting was adjourned with vote of thanks from the chief and the consultant. The meeting closed with a word of prayer from Anna Njeri Gitau.

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 21/8/2018 Time: 2:00 – 4:00 Pm Venue: MACHARO

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Simon IC NDEGWA	KIAMUNYI	24807581	0724741212	
2.	Evans M. Ongeri	Kiamunyi	9314342	0727777349	
3.	Margaret Wanjiku Ngwiri	"	29829502		
4.	Hannah Njeri Situti	"	23084221		Hannah
5.	John Mbiva	"	23054221		
6.	Priscillah Gathoki	"	1751836		
7.	Margaret Gichema	"			
8.	ADOLYNE WAHIGUI	"	27224373	0703949252	
9.	Hellen Njeri	"	11429554	0716899438	
10.	Grace Wangari	"	85765961	0716261314	
11.	Mary Ndungu	"	~~0711239429~~	0711239429	Mary Wanjiku
12.	Lucy Wangui Ngero	"	05502581	0724494100	

ASST. CHIEF
MERCY NJERI SUB-LOCATION
EVANS MORONGE
Sign.
Date 31/10/18

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	DAMARIS WANJIRU	ICA[illegible]/1	9409929		
14.	SAMUEL NJUGUNA	"	26156222		
15.	AYUB MUNGAI	"	25131673		
16.	DAVID MAYAMBURA	"	28291893		
17.	Jeremiah Mattango	"	12839508		
18.	Paul Gitonga	"	3957137		
19.	Stephen Kamau	"	27218023		
20.	Simon Njuguna	"	29029026		
21.	Antony Macho	"	24963729		
22..					
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Public Participation Attendance List
Page 2 of 2

ASST. CHIEF
MERCY NJERI SUB-LOCATION
EVANS MORONGE
Sign
Date 31/10/18

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 31 Oct., 2018 Time: 2.00 - 4.00 pm. Venue: MACHAKO Masaree / Nakuru

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	Hellen W. Ngeru	Kiamunyi	36326649	0724609755	
2.	FRANCIS M. MUREU	Location	22933655	0721 582364	
3.	GEOFFREY K. MAINGI	"	11523703	0719159592	
4.	JOEL N CHIERA	"	14609159	0729674701	
5.	ANTONY GICHINE	"	33067778	0726930796	
6.	JULIET NJAMBI	"			
7.	REGINA THEURI	"	6860569	0713148133	
8.	BENADETTA NYAMBURA			0710629979	
9.	EUNICE WANJIKU	"	23650401	0729413809	
10.	Elizabeth Njeri	"	36293335 243	0710212594	
11.	JAMES KAKUKI	"	0342272	0722273059	
12.					

ASST. CHIEF
MERCY NJERI SUB-LOCATION
EVANS MORONGE
Date 31/10/18 Sign

13.5.5 Minutes of meeting held at Morop (GDC Kabarak)

Minutes of meeting held at Morop (GDC Kabarak) on Thursday 1 November, 2018 from 2:30 pm – 4:30 pm

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/2018: Opening Remarks

The meeting was called to order by Chief, Mr. Robert Lagat at 2:30 am and was opened by a word of prayer by Aaron Sirma. He also went ahead and introduced his members from the assistant chiefs to the "Nyumba Kumi" representatives. He went further to welcome the consultant to introduce and take over the meeting.

Plate 12.5 Morop (GDC Kabarak) Public Consultation Meeting

Min 2/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/2018: Concerns, comments and questions from the community members

Knowledge of the Project

The consultant explained to the community where the proposed project area stood. After elaboration from the consultant, the members understood what the project was all about.

Envisaged project benefits

The community appreciated that the project would boost the level of development in the area (improved roads) and provides employment opportunities.

Envisaged negative impacts

Environmental pollution in the form of noise resulting from construction activities would occur. Moreover, diseases and injuries would be caused by dusts and flying rock fragments emanating from the project sites during construction. Excavation activities would cause open pits that pose a safety hazard especially at night.

Proposed Mitigation Measures

Safety gear should be provided to the community members who will be employed on site to minimize the occurrence of injury incidences. A mobile clinic should be set-up at the project sites to treat medical emergencies and injuries immediately.

The community will liaise hand in hand with the contractors / proponent at all stages of the project.

Compensation

The community asked for adequate compensation for the loss of their grazing land. Adequate compensation will be required for the structures that would be demolished to pave way for the project. The Community also requested for compensation of trees that will be cut during construction.. Unskilled employment opportunities should be reserved for community members.

Corporate Social Responsibility

As part of GDC's Corporate Social Responsibility efforts, community members recommended that water projects such as boreholes be constructed to serve the area. They recommended for improvement of existing roads, schools and dispensaries.

Summary of the key issues discusses:

Name	Question /Concern	Consultant's Remarks
Mr. Kipyegon (Administrator)	I welcome the team. I am the chairman to all public participation meetings and I know the law. I hope you bring good news	
Wycliffe Osore	Can GDC sink water wells for us as part of their CSRs?	GDC will priorities its CSR activities and advice when this could be done.
Stephen Kipkoro	There were promises made with GDC in previous engagements at Merica Hotel in Naukru town, can GDC review those minutes?	Community – GDC engagements could take place later since GDC needs constant engagement with the people on groung.
Kelvin Kishi	I am not a local resident here but I work around this place, can I benefit from the project too?	Yes you can. CSR activities are meant to benefit not only those affected by the project but also the

Name	Question /Concern	Consultant's Remarks
		immediate neighbors.
Waweru	We anticipated GDC would come today. Before getting this land we are sitting on GDC promised a lot of things but have not done. This includes scholarships, water etc. We the new project comes all the way to Rafiki. Will GDC lease or buy me out? How will the project affect me is I am a neighbor What's the life span of this project 10, 100 years etc.	Due to unavoidable circumstances, GDC had to postpone their mission on accompanying the consultants to a later date. This would even be done without the consultant's presence.
Michael Ruto	Why did GDC not come to ground GDC came here and made promises to us, why haven't they come today?	
Elijah Kipruto	GDC should have been here to explain to us a few issues regarding the previous project.	
Backla Choge	GDC knows our problems. We had already discussed these issues, why didn't they show us?	
Senator	Where exactly is the project location?	The consultant explained the project location with a map,.
Administrator	We don't object the project, the new	

Name	Question /Concern	Consultant's Remarks
	Menengai West Drilling project has no relationship with phase I (The Menengai Caldera), I think we should just focus on the issues of this project for now. We can talk about its impacts to power however I think we should start from the issues on the ongoing project.	
Waweru	Similar studies were done 5 years ago; do you have a report on what's happening to our land?	Reports exist and are in custody with relevant authorizes. Anyone could get access to them.
Administrator	How will we ensure GDC does according to its promises?	Engage environmental and social specialists to help oversee the project
Senator	Let's just concentrate on the environmental and social issues of Phase II (Menengai West) the rest we'll discuss in AOB.	
Enas Kipyegon	GDC should ensure or youths (Morop people) are employed in projects. GDC has only a few community representatives.	
George Ruto	GDC should know we are very enlightened	
Susan Soi	GDC's first project did not maximize on their promises.	GDC should consider doing the Menengai West project in a different fashion as opposed to the first project especially on sites relation to promises.

Min 3/4/2018: A.O.B

The community concerns are GDC's presence on ground. They needed explanations on promises based on employment among other. They then assured the consultant that manning of the trees will be their responsibility to full maturity.

Adjournment

The meeting was adjourned with vote of thanks from the chief and the consultant. The meeting closed with a word of prayer by Rev. Phillip K. Rono. The list of attendance is attached here in below.

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

Public Participation Attendance List

Date: 1/11/2018 Time: 15 Hrs Venue: GDC Kabarak Farm

No.	Name	Location/ Designation	ID No.	Contacts	Signature
1.	ROBERT LAGAT	MAKUTANO	20510534	0726494519	
2.	LUKA KIPYEGEN	RAFIKI	6105365	0723972818	
3.	Wawem Nyangi	Rafiki	7002412	0722602942	
4.	SUCAD SO	"	12826477	0725598871	
5.	George Rotto	"	4550714 ~~0721914077~~	0721914077	
6.	Mark Kiprotich Maina	EX JACK Eram Sch	10754328	0720-459-220	
7.	EDWIN K KIPKEMEI	Chemgei	25228793	0724923621	
8.	BACKLA CHOGE	Rafiki	20562079	0726627448	
9.	Elijah Kiprotich	Rafiki	1365265	0721-606693	
10.	Andrew Chepsaigut	Marop	0338292	0722736648	
11.	Stephen Kipkoni	14 Fatmi	2146434	0721627626	
12.	Evans K Kiyeyon	Rafiki	22553157	0721917630	

Public Participation Attendance List
Page 1 of 2

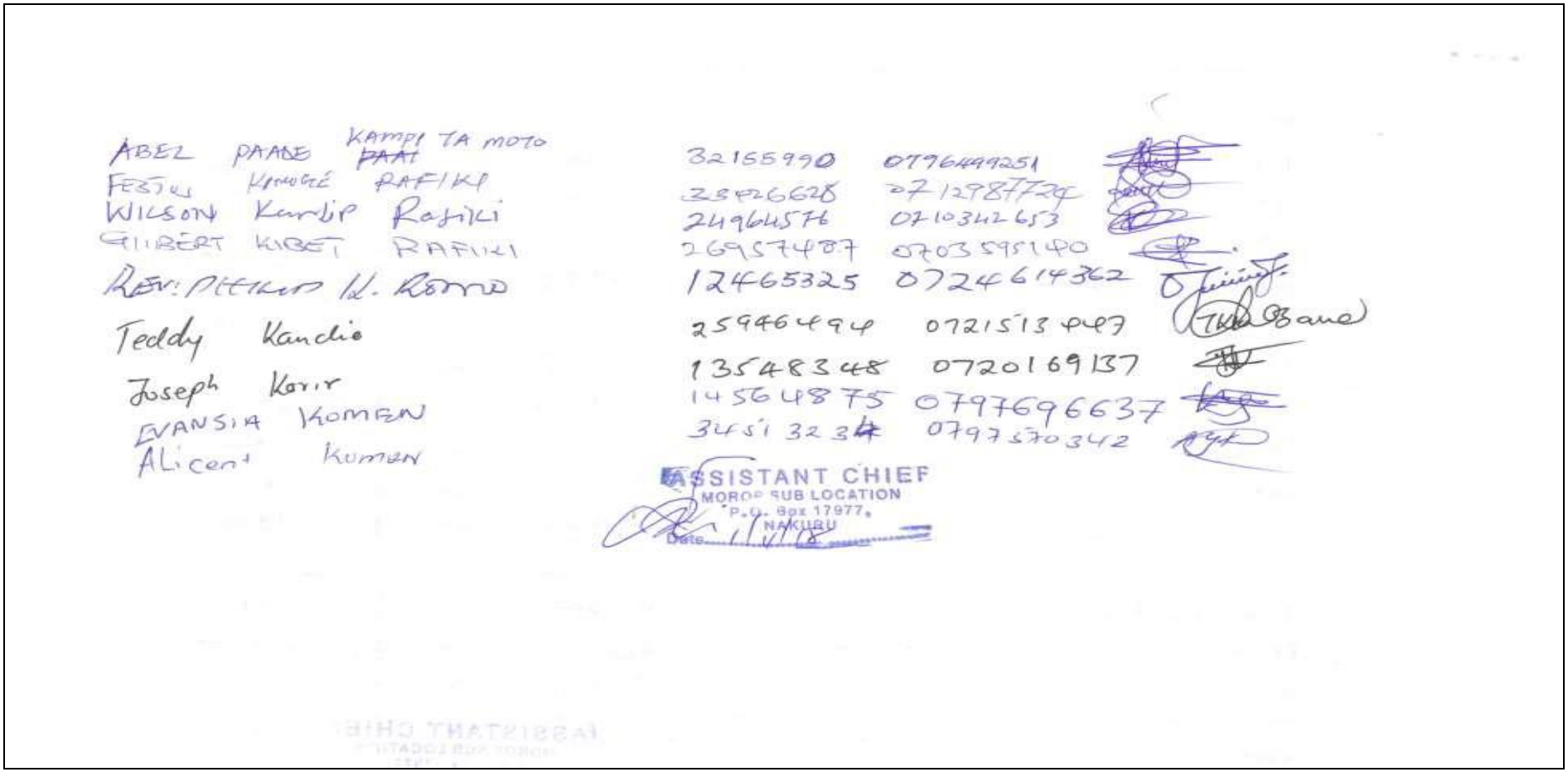
ASSISTANT CHIEF
MOR... SUB ... TION
P.O. ... NAKURU
1/11/18

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

No.	Name	Location/ Designation	ID No.	Contacts	Signature
13	MARK T. CHELANGA	RAFIKI	13066869	0726771585	
14.	[illegible]	—	9172313	0780 714183	
15.	Mohamed C Ruto	"	0602956	0722-476028	
16.	Harun K. Sioms	"	6597130	0720802594	
17.	Stephen Kiyai	"	20508646	0720067481	
18.	Wilson Kiprunui	"	12986829	0720793683	
19.	FRANCIS KAMGOGO	"	14564528	0712883990	
20.	MAUREEN KIOHE	"	34329705	0711171785	
21.	WINNIE KIOHE	"	37022380	0702106894	
22..	Wycliffe Osore	Mungu Line	21805156	0798891892	
23.	MOSES KICHIHA	—	20368712 20265[illegible]	—	
24.	MIRIAM J. KENEI	RAFIKI	11375073	0729268571	
25.	EMERICIANO NELLY	RAFIKI	36776747	0745 309[illegible]	
26.	KISH KIPLANGAT	RAFIKI	34336469	0702107712	

Public Participation Attendance List
Page 2 of 2

ASSISTANT CHIEF
MOROO SUB LOCATION
P.O. Box 7977,
NAKURU
Date 11/11/18


ABEL PAARE KAMPI TA MOTO
FESTUS KIMUGE RAFIKI
WILSON Kurbir Rafiki
GILBERT KIBET RAFIKI
Rev: Peter K. Rono
Teddy Kandie
Joseph Korir
EVANSIA KOMEN
Alicent Kumen
32155990 0796449251
25426628 0712987729
24964576 0710342653
26957487 0703595140
12465325 0724614362
25946494 0721513497
13548348 0720169137
14564875 0797696637
34581234 0797570342
ASSISTANT CHIEF
MOROP SUB LOCATION
P.O. Box 17977,
NAKURU
Date 1/11/18

13.5.6 Minutes of meeting held at Mercy Njeri Center (Kiamunyi)

Minutes of meeting held at Mercy Njeri Center (Kiamunyi) on Wednesday 31 October, 2018 from 10:30 am – 12: 00 noon

Agenda

1. Opening remarks
2. Team & Project Introduction
3. Concerns, comments and questions from community members
4. AOB

Min 1/2018: Opening Remarks

The meeting was called to order by Chief, Mr. Simon K. Ndegwa and Evans M Ongeri 10:30 am and was opened by a word of prayer by a Mwalimu Kihara. He went further to welcome the consultant to introduce and take over the meeting.

Plate 12.6 Mercy Njeri Center (Kiamunyi) Public Consultation Meeting

Min 2/2018: Team & Project Introduction

The consultant introduced the project and the ESIA study of the proposed Menengai West Geothermal Drilling Project to the members elaborating its objectives and the role of communities and leaders in development projects.

The legal requirement that development projects are subject to Environmental and Social Impact Assessment was outlined. The consultant explained that the proposed project would have both positive and negative impacts on the surroundings and on the community and welcomed them to voice their concerns, comments and questions.

Min 3/2018: Concerns, comments and questions from the community members

Summary of the key issues discusses:

Name	Question /Concern	Consultant's Remarks
Community Members	The members insisted that the ESIA Study meeting had to have representation from GCD to answer to their previous engagements.	This meeting did not materialized

Way Forward

The community insisted that, new project will only continue after the proponent has had a discussion with community members on issues pertaining to their initial agreements.

Min 4/2018: A.O.B

A committee was formed to follow up with GDC on issues pertaining to previous engagements.

Adjournment

The meeting was adjourned and the chief thanked the team of consultants and the community members.

13.5.7 Minutes of meeting held at Chief's Camp Ol' Rongai (2nd Meeting)

Minutes of meeting held at Chief's Camp Ol' Rongai on Tuesday 9 November, 2018 from 10:00 am – 2: 00 pm

AGENDA

1. Prayer
2. Introductions
3. Project Brief by GDC
4. Plenary Session
5. Resolution
6. A.O.B

Min	Agenda	Discussions/ Issues	Remarks
1	Prayer	The meeting was called to order area chief being Chairperson and requested one of the willing participants to open with a prayer.	Rueben Omondi- Chairperson Pastor. Lisamula- Prayer
2.	Introductions and background	The area chief being the Chairperson, introduced his assistant Betty Lagat. He highlighted that the current meeting was a follow-up to a previous meeting convened by his office and the GDC's ESIA/LACP/RAP consultant on 30 October 2018 regarding the Menengai West Geothermal project. It was as a result of the meeting of the 30th October that the community sought audience with GDC through a petition dated 5 November 2018. The chief requested the elders who had filed the petition introduce themselves. He briefly introduced the reason for the meeting. He indicated that when the consultant (Log Associates) held a public Baraza on 30th October 2018, the public had numerous questions, some of which the consultant responded to adequately while some, which could only be addressed by GDC went unaddressed hence prompting the need for a separate meeting with GDC in attendance. He then asked the GDC team to introduce themselves, led by Environmental Manager and Acting Regional Manager, Mr. Gabriel Wetang'ula, Mr. Wetangula then introduced the log consultant led by Mr. Ezekiel Oranga. Mr. Oranga introduced the rest of his Log Consultants team	Rueben Omondi - Cheif Gabriel Wetangula- GDc Grace Mwai-GDC Ezekiel Oranga- Consultant
3	Brief by GDC	The Community Relation Manager thanked the public for welcoming them and noted the importance of the meeting and assured them that all their issues will be heard and responded to in detail. She then requested Environmental Manager, Gabriel Wetangula, to address the	Grace Mwai - GDC

		gathering.	
	a. Project Progress	Mr. Wetangula gave progress of the geothermal project. He stated that production of geothermal energy goes through three Stages: 1. Exploration 2. Appraisal, and 3. Production He indicated the communities in Ol rongai and Kwa Gitau have been engaged from Phase I (Geothermal Drilling Project in the Menengai Crater since 2003), previously under KengGen. He reminded the gathering that the ESIA that Phase I project was done and approved in 2008. He highlighted that the caldera was un inhabited. He noted that since GDC took over from KenGen the management of Phase I project in the caldera in 2008, it has continually engaged the local communities. The phase I project has production capacity of 105MW. The project is in its last phases for construction of power plant for which GDC is engaging 3 international companies. Mr. Wetang'ula stated that after studies done in the crater and adjacent areas showed there is potential for production of geothermal power in the region. The current focus is on five possible well sites outside the caldera. He noted that since these areas are inhabited by individual citizens and are therefore private lands, for any exploration activities to start, an a new ESIA has to be done. He also observed that the Phase II – which is outside crater is part of the exploration activities towards the realization of the estimated 1,600MW of geothermal power potential of the Menengai area. Mr. wetang'ula highlighted that this Project is just in its initial stages and they can only start exploration once the community agrees with project and NEMA grants them licence to do so.	Gabriel Wetangula - GDC
	b. ESIA study	Mr. Wetang'ula confirmed that since the caldera environment and that outside are different, they had to seek the services of a consultant to conduct a new ESIA study to determine both positive and negative impacts of Exploration activities. The consultant is to sensitize the public of the impacts, and get their views on the probable mitigation	Gabriel Wetangula-GDC

		measures of the negative impacts and how to enhance the positive impacts of project activities.	
	c. Census and Valuation of Land	He stated since the project is in private property, for GDC to carry out any activity, they must get approval and have an understanding with property owners around whose property project activities might be conducted (drilling of wells, steam evacuation, road works, etc) and passage respective infrastructure will affect. This will help GDC understand and capture all properties and obtain necessary details about both the property owners and the details about the property affected. The consultant is therefore required to develop a LACP/RAP using this census and valuation information. To obtain this information a consultant is supposed to carry out all the census and valuation of land. He stated that however, at this exploration stage persons will not be relocated. GDC intends to negotiate a five-year lease (renewable if necessary) with affected persons.	Gabriel Wetangula - GDC
4	Plenary Session	The Plenary session included questions and answers. The session was moderated by Area chief Reuben Omondi	Reuben Omondi
	Questions	Mr. Nyamboki, the chair of the community elders' forum highlighted the community had listed for consideration by GDC He indicated the need for full disclosure of information about the project, and need to be informed and involved at times. He stated the need for partnership between GDC and the community. He indicated, they understand their right to information. The following were the questions raised by the community through Mr. Nyamboki: Similar sentiments were raised by other community leaders including Mr. Kanyingi, Mr. Alexander Kenda, Mr. David Macharia, John Boss, among others. Issues raised were as follows: 1. Whether the ESIA conducted in 2008 and NEMA approval thereafter would be the one to be used under the current proposed project 2. At what point did GDC discover the geothermal potential in the area 3. Whether everyone within the project area would be relocated considering that the area map provided in the GDC website is so wide 4. Will community land be acquired under compulsory acquisition procedures by government 5. The promises made in 2008 relating to CSR were not met. Could this be in any way related to the possible relocation of communities under the current project. 6. Why did the GDC delay in making disclosures to the community 7. How did the GDC settle on the consultants to effect the ESIA and LACP exercise. 8. Whether by signing the consultant's list of attendance meant	Elder- Mr. Nyamboki Elder- Alexander Kenda Elder- Mr. Kanyinge Mr. Muraya Mr. Macharia David Elder William Mr. Jonh Boss Elder Samson

		that the community had now agreed to surrender their land 9. What will happen to the land owners if adequate steam is found within their plots. 10. Does valuation of land and property now mean that the people affected will have to be relocated 11. What happens to the land/plots if GDC fails to find adequate steam after the lease period 12. Whether the community will benefit from the water to be used by GDC in the course of their exploration work 13. What are the timelines for the current project	
	Response	Mr. Wetangula stated, GDC understands the need for community engaged and the reason why they immediately came for the meeting once they were requested to He also stated, GDC is open and ready to avail all the information pertaining the project, thus the reason for posting project information on the GDC website to enable wananchi ease of access. He observed as follows: • ESIA of 2008 will not be used for the current project. The crater environment is different from the environment in the current focal area. Also, NEMA License is Specific and conditional to an area. The reason why we contracted Log Associates is to carry out a new ESIA study for this project. • Community engagement is a continuous process and GDC will continue to involve the community throughout. • The list of attendance at meetings is meant to show that affected persons were consulted and their views taken into account. This list should be verifiable by NEMA or any other stakeholder. • GDC does not anticipate to conduct compulsory acquisition. He said GDC will negotiate with individual owners to lease as the part of the affected land for a period of 5 years renewable for the exploration phase which we intend to start. No one will be compulsorily evacuated from his place • The extend of the project is as provided by the five wells and with exact coordinates and the infrastructure plan from the maps on the GDC website and can be accessed from the GDC regional office in Nakuru • The extend of the area where wells will be drilled was determined by combined geophysical, geological and geochemical surveys. These studies built on previous studies conducted by the British and Italians earlier in the 20th C. • In case GDC does not find enough steam to lead to appraisal and production, the consultant is expected to provide an ESMP framework through which the area will be restored back to its original use. • GDC does not intend to purchase land at this stage of exploration. They will only negotiate for a 5 -year renewable lease with the affected land owners. • Valuation and census is meant to give information about the owners and the value of their properties • As neighbors, GDC will be open to sharing water with the community • This is just the first stage of three stages involved. The result of the exploration stage will determine whether to proceed to the appraisal stage. Exploration can take up to and more than 5	Gabriel Wetangula

		years. • GDC understands these are private land parcels and the reason why we are carrying out ESIA study and Census and Valuation • He highlighted that the ESIA/LACP/RAP consultant was recruited through a competitive process and after convincing the GDC that they had the necessary expertise to conduct the work. He introduced Mr. Oranga and his team to the community and requested that they allow them proceed with the study on behalf of the GDC	
5	Other observations	• Mr. David Macharia indicated the need to involve all genders and especially youth, not just the elders in matters concerning consultations of the project • Women representative noted that water is a big issue and they will grateful if GDC provides water during phase II project.	Mr. Macharia David Mr. William Mr. Jonh Boss Mr. Samson
6	Resolutions	The following resolutions from the meeting were read by Elder Nyamboki: 1. The ESIA and LACP/RAP studies should continue and hopefully lead to the acquisition of a new ESIA licence from NEMA 2. The focal area identified in the current map provided by GDC to be the area under consideration 3. Constant consultations and disclosures with the community during the project through a clear and organized community structure is necessary 4. Consultant to provide and proceed with a new census and valuation schedule 5. Discussion on resettlement have been shelved since the exploration stage will not involve resettlement of persons 6. Areas marked MS 201, MS 202, MS 203, MS 204, MS 205 and MS 206 should be given special attention during the study.	Elder- Mr. Nyamboki
7	A.O.B	• In expressing the benefits brought about to the community by the GDC, Mr. Wachiria enumerated the number of youths who have been employed by the company either on contractual or permanent basis. • Mr. Ben Yatich, the Sub County Administrator, Rongai Sub County urged the community to support the Menengai West project noting that it is likely to bring about benefits to the community. He allayed any fears that the project might lead to anyone losing property to government without adequate consultations and compensations • There being no other business, the meeting was adjourned with a word of prayer at 3.30pm	Mr. Wachiria Mr. Ben Yatich

13.6 List of Chief Consulted

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

List of Chiefs and Sub chiefs

No.	Name	Location	Sub location	ID No.	Contacts	Signature
1.	SIMON K. MDEGWA	KIAMUNYI	OLIVE INN	24[illegible]881	0724741252	
2.	EVANS M. OMGERI.	"	MERCY NJERI	9314392	0780073597	
3.	Hellen W. Ngero	"	Mercy Njeri	36326[illegible]	0[illegible]9755	
4.	JOHN CHEPKWONY	Kampi ya moto		12439120	0724012310	
5.	PATRICK N. MBUGUA	KAMPI YA MOTO	KAMPI YA MOTO	11067086	0722947062	
6.	GLADYS S. KIGEN	"	Kampi ya Moto	24541375	0727146605	
7.	SUSAN SOI	MARUBA MORR	MORR	12826495	0725[illegible]852	
8.	ROBERT LAGAT	MAKUTANO	MAKUTANO	20510534	0726494519	
9.						
10.						
11.						
12.						
13.						

List of Chiefs and Sub Chiefs

Consultancy Service for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

List of Chiefs and Sub chiefs

No.	Name	Location	Sub location	ID No.	Contacts	Signature
1.	BETTY J. LAGAT		MENENGAI	21250639	0721343061	
2.	ISAIAH O. ALIKO		BARINA	11716168	0710905220	
3.	REUBEN D. OMONDI	OL RONGAI		7953152	0721321051	
4.	ESTHER N. MILGO		KIRIMA	9555002	0720818591	
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						

THE CHIEF DATE 30/10/18 OL-RONGAI LOCATION

Terms of Reference for Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County

PROPONENT: GEOTHERMAL DEVELOPMENT COMPANY (GDC)

Approved
15/10/18

9 October, 2018

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY
RECEIVED
12 OCT 2018
ENVIRONMENTAL IMPACT ASSESSMENT
P.O BOX 67545-00200 NAIROBI

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NEMA/TOR/5/2 GEOTHERMAL DEVELOPMENT COMPANY (GDC). Date: 16/10/2018

RE: **ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR) FOR THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY**

We acknowledge receipt of the TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act Cap 387, Legal Notice 150 and the Environmental (Impact Assessment and Audit Regulations 31 and 25, your terms of reference for the Environmental Impact Assessment (EIA) study for the proposed Menengai West Geothermal Drilling Project, Nakuru County

has been approved.

You shall submit ten (10) copies and one electronic copy of your report prepared by a registered expert to the Authority.

BONFACE MAMBOLEO
EIA SECTION HEAD

09 October 2018

The Director

National Environment Management Authority (NEMA)

P.O Box 67839 - 00200

Nairobi, Kenya

Dear Sir,

Re: Environmental and Social Impact Assessment (ESIA) Study for Menengai West Geothermal Drilling Project, Nakuru County – Terms of Reference

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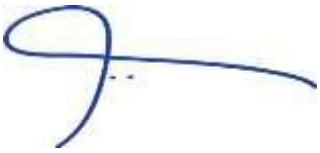
Following your issuance of Notification to conduct a Full ESIA Study on the above assignment, we are pleased to herewith submit our Terms of Reference (TOR) detailing the Scope of a Full ESIA Study. We look forward to your input and comments on the same.

Thank you for your cooperation.

Yours Faithfully,



Eng. Prof Lawrence Gumbe

Lead Environmental Expert

Registration No: 0831

Table of Contents

1.0 INTRODUCTION

1.1 Background

The **Geothermal Development Company** is mandated with development of **5,000MW** of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospects across the Kenyan Rift i.e. Menengai, Olkaria, Suswa, Longonot, Eburru, Arus-Bogoria, Lake Baringo, Korosi, Paka, Lake Magadi, Badlands, Silali, Emuruangogolak, Namarunu and Barrier – Kenya. The Greater Menengai geothermal project is among the more than 14 high temperature geothermal areas within the Kenyan Rift being developed by GDC for geothermal energy utilization.

The Menengai west geothermal prospect is located west of the Menengai caldera. Geoscientific surveys including geology, geochemistry and geophysics were carried out GDC where five (5) exploration wells were sited. Results indicate that Menengai west prospect may be hosting a high temperature geothermal system. Drilling in this field was scheduled to commence on July 2018.
In 2008, ESIA for Menengai Caldera Project area was done by NEMA registered EIA/Audit Team of Lead Experts. The project and ESIA reports were prepared and submitted to NEMA, which issued EIA License No. NEMA/EIA/VEIA/193.

Financing of Menengai Geothermal drilling project has been through the Government of Kenya i.e. Treasury through the Ministry of Energy & Petroleum (MoEP) and other Multilateral lending agencies/donors such as Africa Development Bank (AfDB), French Development Bank (AFD) among others. Most of these banks have led mission to Menengai to assess the viability of the project of which ESIA study report has been one of the key documents guiding their assessment.

The Environmental Management and Coordination (EMCA) Act, 1999 requires that an Environmental Impact Assessment (EIA) is undertaken for proposed activities that are likely to have a significant adverse impact on the environment and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The second schedule of the EMCA Act, 1999 provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority. The proposed Geothermal Drilling Project falls within the second schedule of the EMCA Act under '*Mining including quarrying and open cast extraction of Geothermal energy exploration and production*.' and therefore requires an ESIA. The proponent has commissioned the Environmental and Social Impact Assessment study in compliance with the Act.

1.2 Project Description

The proposed power generation system and plant configuration have a conceptual design similar to those of the Menengai Caldera Project. The proposed project involves civil works for construction of access roads, drill sites and drilling and testing of selected explorations, appraisals, production

geothermal wells to exploit geothermal energy. Well testing activities include down hole, completion and other scientific tests. The exact number of production wells will be determined by the average output of each well. The proponent however envisages using only **two (2)** wells. The wells will be drilled to economical depths of approximately 3000 m to access geothermal fluids (steam and water).

The steam generated from the geothermal activities will then be transmitted through pipelines to the turbines of the proposed a geothermal power station for electricity generation.

1.2.1 Project Locations

The area referred to as "Menengai West Geothermal Prospect" is located west of the Menengai caldera in the Kenya Rift valley. The Menengai geothermal area is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi, Kenya. The prospect area is located along the Ol'Rongai Hills located on the western side of the Menengai Caldera. The major town centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo. Table 1.1 below gives the coordinate locations of the five wells using the Coordinate System UTM Arc 1960 Zone 37s.

Table 1.1: *Proposes Well Sites Coordinates*

SNo.	Name	Eastings	Northings
1	MS 201	169139	9983845
2	MS 202	168984	9984832
3	MS 203	170282	9983478
4	MS 204	167806	9984870
5	MS 205	167828	9982410

The Menengai west geothermal project falls on the western side of the Menengai caldera floor. The caldera floor, which is fairly flat, covers an area of about 88 km^2 and is partially covered by young rugged lava flows. The Menengai west floor extends around Boita, Menengai Station, Ngata Farm and Kabarak Estate, the topography is made up of flat grounds whose relief is low. The prevalently flat area north of Menengai between Mogotio, Kampi ya Moto, Kisanana and the Bahati Escarpment is enlivened by north trending, double chain of Ol"Rongai volcanic centres by the roughly triangular, flat topped El Bonwala Hill and by arcuate chains of small hills that span from the Ol"Rongai Estate to the Athinai Estate. East of the area is bound by the alignment of the Bahati Escarpment and the Marmanet rift cliffs bind the northeastern part.

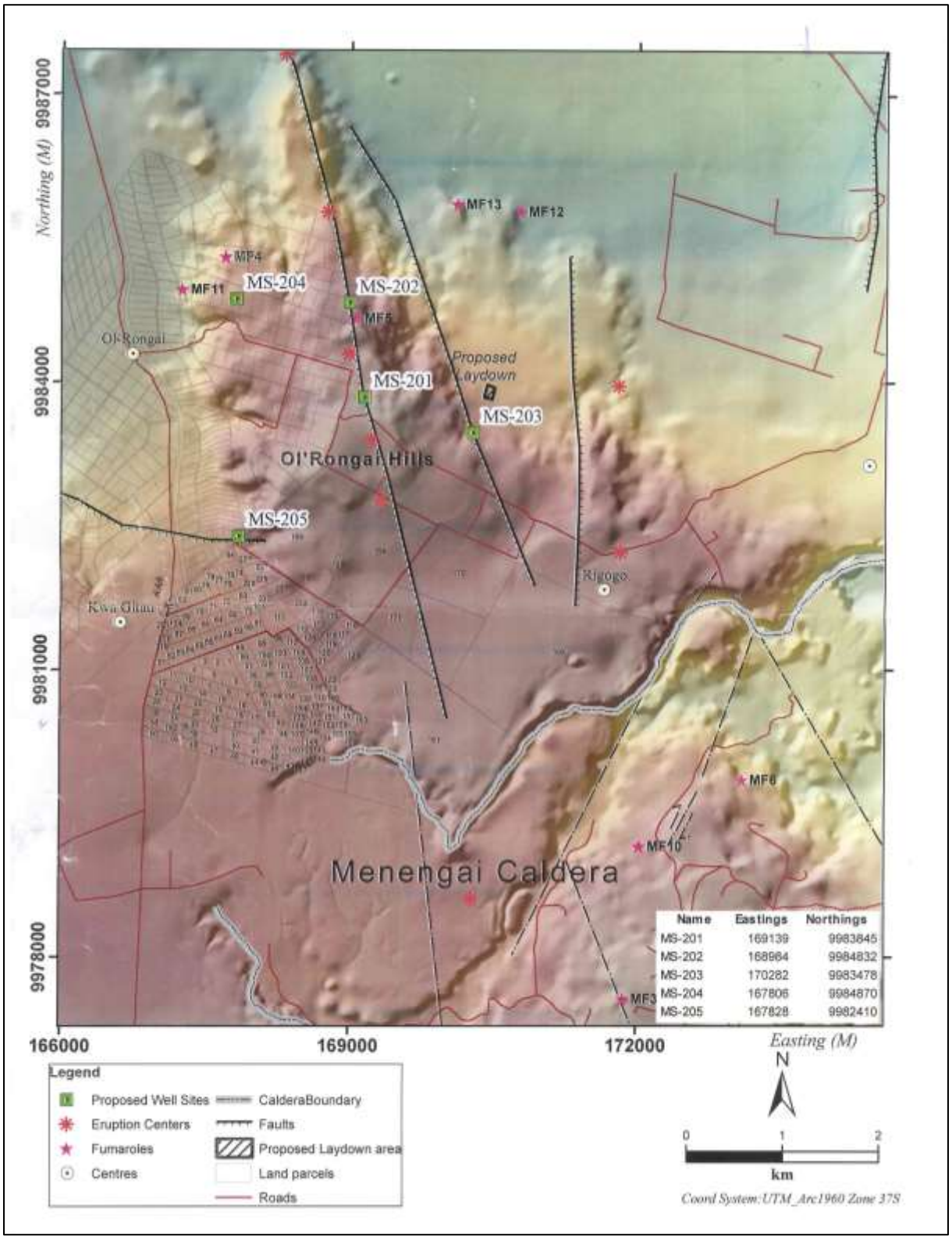


Figure 1.1: A map of the proposed Menengai west geothermal prospect

1.2.2 Main Project Activities

The proposed projects' activities can generally be divided into four stages, namely: preconstruction/project design; construction; operation; and eventual decommissioning of the proposed geothermal drilling project as described below.

1. **Pre-construction/Project Design (Power plant, steam gathering system etc.)**

This shall entail design, procurement and construction of the steam gathering system, power plant and substation and transmission lines. The scope work entails carrying out of detailed design for all the systems. These activities include;

- Land for site access roads, water boreholes, and well pads shall be leased from the Government of Kenya and acquired from private landowners. Private landowners shall be compensated for land acquired.
- Sites for access roads, water boreholes, and well pads shall be demarcated and vegetation cover cleared
- Water pipeline routes from the water boreholes to the resource area within the Menengai west geothermal project site shall be demarcated and vegetation cover cleared.
- Water pipelines shall be delivered to the site and laid from the water boreholes to the resource area within the Menengai west geothermal project site
- Ground compaction materials e.g. murram, for preparation drill pads for water and geothermal steam shall be excavated from suitable areas outside the project site and delivered to the project area.
- The site access roads, drill pads and wastewater re-circulation ponds shall be constructed and leveled.
- Site preparation activities shall be undertaken with due care to ensure minimal land surface disturbance through vegetation clearance.

The procurement of the various goods and services and contracting of the construction firm and other consultants shall begin after the completion of the ESIA process.

2. **Construction (During drilling and well discharge tests)**

After the exploration and drilling phase, the project site shall be prepared for production. The construction phase shall involve the construction of the geothermal field(s), infrastructure, power plants, and transmission lines. Activities in this phase of development shall include:

- Clearing, grading, and constructing access roads
- Clearing, grading, and constructing electrical generation facilities
- Building facility structures
- Drilling and developing well fields/ Drilling and well test equipment, materials and labour will be transported and delivered to the project site
- Wellhead equipment, silencer, lined brine disposal ponds, and other safety control devices such as valves will be installed to control the geothermal fluid discharges.
- Rotary drilling technology will be adopted during drilling processes
- Disposal of drilling solid waste materials, effluent, and geothermal brine from discharging wells during testing.
- A chain-link perimeter fence will be installed around drilling effluent and brine disposal ponds.
- Activities involved during drilling and well discharge tests will be undertaken with due care to avoid causing adverse impacts on the environmental and public health quality profiles.
- Installing pipeline systems; and
- Installing meters, substations, and transmission lines

The construction phase of the development process will result in the greatest area of land disturbance at the geothermal energy project site, although some of the disturbed land would be reclaimed once construction activities end.

3. Operation and maintenance

The operations and maintenance phase shall involve the operation and maintenance of the geothermal field(s) and the generation of electricity. The types of operations and maintenance activities will depend on the size and temperature of the geothermal reservoir. Typically, only high-temperature reservoirs are suitable for the utility-scale production of electricity, although new technologies are proving that lower-temperature water can also be used for commercial purposes. The operations and maintenance phase can last from 10 to 50 years.

4. Decommissioning

Once geothermal production ceases, the production wells are abandoned, facility structures and infrastructure will be removed, and all the disturbed areas at the project site reclaimed. This shall involve plugging, capping, and reclaiming the well site. Reclamation will includes removing the power plant and all surface equipment and structures, regrading the site and access roads to preproduction contours, and replanting vegetation to facilitate natural restoration. The Environmental and Social impacts associated with the decommissioning process shall be minimised through the implementation of an environmental and social management plan (ESMP).

1.2.3 Budget

Capital costs for the proposed Menengai West Geothermal drilling project are based on the following unit costs, which were derived from the reports on the African Geothermal International Limited (AGIL) prices on similar projects. According to AGIL, the project costs for drilling one well is said to cost around USD 5 million at a depth of around 3,500m hence the cost for drilling five similar wells would be estimated at **USD 25,000,000.**

1.3 Project Alternatives

1.3.1 The 'Do Nothing' Alternative

The "Do Nothing / No Action" alternative is often defined by the baseline information and is crucial in the assessment of impact because other alternatives are weighed with reference to it. Qualitative analysis indicates that there will be no significant negative effect on either the bio-physical or the socio-cultural environment of the proposed project. Without the project, we cannot say the environmental situation will either improve nor can we say that it will necessarily deteriorate.

The "No Action" Alternative is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The proponent will not benefit from the revenue expected from the facility
- The government kitty will not benefit from the revenue to be earned due to the establishment of the proposed project
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of electric power will not occur
- Information flow and public education awareness through electronic media, especially the television will be hampered
- The economic status of the Kenyans and the local people would remain unchanged
- The local skills would remain under utilized

1.3.2 'With Project' Alternative

The security of energy supply especially electricity generation in Kenya seems to be threatened by climate change induced phenomenon, chief among them, drought which negatively impacts other sources of power generation, notably hydro. Inadequate electricity generation capacity and high power bills have been perennial problems in Kenya prompting the Government to explore various ways of tackling the glitches.

A shift to alternative sources of energy such as geothermal power which is environmental friendly and more affordable to run compared to other sources of energy like fossil fuel will insulate the

country against the effects of drought, which often interferes with hydroelectric power which historical has been the major source of installed power.

According to Vision 2030, it is estimated that the national power requirements in the next 17 years will reach 15000MW, which is about ten times the current 1700MW power generation capacity. This justifies the immediate need to more than double the power generation to 5000MWe in the next 5 years to meet the rising demand and move in tandem with economic growth projections.

There are however several structures and land that would be affected by the proposed projects, hence the need for adequate mitigation mechanisms to minimise these effects whilst the project is relocated.

The figures below shows some of the affected features in the project,

Figure 1.2: Affected structures within the project area

Figure 1.3: An existing murram road within the project site

Figure 1.4: Affected maize plantation farm within project site

Figure 1.5: Private land to be affected by the project

1.4 Potential Environmental and Social Impacts

The following section presents the anticipated environmental, landowner, and social impacts related to the construction and operation of the geothermal west drilling project identified at scoping level.

Positive Impacts

1. **Creation of Employment Opportunities**

Both skilled and unskilled labour will be required during the construction and maintenance of the geothermal plant. Some short term employment opportunities during the construction phase include: vegetation clearance, pit dressing, loading and offloading of construction materials and deliveries, record keeping and provision of security at active sites and temporary campsites and stores. Also, there will be some indirect job opportunities such as catering, kiosks, barber shops, etc., to service the crew.

Long term employment opportunities resulting from the project include maintenance works which may require skilled labour. Some maintenance activities such as clearing of vegetation clearance along the way-leave will still provide seasonal jobs or the community members.

2. **Increased Electrical Capacity, and Reliability of Supply in Nakuru and Kenya at large**

The construction of the Menengai West geothermal project will be a step forward towards achieving the goals of Vision 2030 with regards to enhancement of electrical capacity. The country has been experiencing inadequate and unreliable power supply due to the current rise in human population and commercial activities. An immediate impact would be the cost of electricity gradually going down and frequency of power outages minimised.

Other notable impacts include:

- Increased industrial activity due to the availability of a steadier and higher capacity power supply in comparison to the existing one.
- Increased establishment of economic and social sectors such as agriculture, hospitals and educational centres resulting from increased availability of electricity
- Boost to the tourism industry that is currently booming in Lake Nakuru and other neighbouring towns as access to electricity will make development and maintenance of lodges much more bearable and able to provide this utility.

3. Contribution to Government Revenue

The Government of Kenya currently charges Value Added Tax (VAT) on electricity consumed for both domestic and industrial use. Construction and running of the Menengai West Geothermal Plant will attract this levy and other charges such as pay as you earn (P.A.Y.E) tax from construction and maintenance employees, and NEMA licence fee paid by the proponent to NEMA. Consultants and construction companies that will be engaged in the project are subject to local taxes.

4. Improved road infrastructure

Implementation of the proposed project will require a road network to facilitate ferrying of materials and equipment to the construction sites. A favourable road network will allow for easy movement of machinery and delivery of construction material to the sites. The contractor will rehabilitate existing roads and/or create new roads which may end up being used in the long term by the residents.

5. Increased economic activity in both the project areas and at the national level

During construction, the workers will need basic amenities such as food, shelter and clothing. There will as well need recreation for time off. All these goods and services will be sourced from providers in the projects are thus increasing the economic activity around the same area.

At the national level, indirect economic gains will be realised too. Construction materials and services locally available will be put into use. These include: materials such cement, sand ballast, reinforcement steel personal protective equipment and services such as transportation of materials and warehousing and logistics.

6. Corporate Social Responsibility (CSR) Benefits

The proponent conducts community social responsibility initiatives for the project affected communities. This is done as a way of giving back to the community in any development project. Communities living in the project affected areas may benefit from water projects, bursaries or schools depending on what they would agree with the proponent to be undertaken as a CSR activity.

7. Enhancement of Tree Species Diversity

Environmental management good practices demand that the proponent ensures environmental restoration on construction completion. Through afforestation with non-invasive indigenous species and landscaping activities – which would involve the local community – **Geothermal Development Company (GDC)** could improve the biodiversity of the project area. Continuous audit of this activity would ensure sustainability of the initiative

8. Benefits of Engagement by Both Genders

The proponent encourages involvement of both Women and men in realisation of the proposed project. Local employment opportunities that will be available during the construction phase anticipate generation of income for both women through activities such as providing food for construction crew and the other such activities.

9. Enhancement of the Socio-cultural and Local Leadership Structures

Leadership in most part of the project area is characterized by authority from the area chiefs at the community level. The proposed project could reinforce the authority of the community leaders as most of the residents entrust them with information and property dealings. It is suggested that the proponent utilises them in every undertaking. This will act both ways in ensuring the project runs smoothly and at the same the proponent would be reinforcing the authority of the chiefs as the community observes how they have been involved.

Negative Impacts

1. Impact on Flora and Fauna

During preparation of drill sites and access roads, vegetation in the demarcated areas will be cleared and sites leveled and compacted using heavy machinery. Vegetation removal will reduce habitat available to the animals for food and escape cover. Interference with ecological niches for the few resident species of the area will lead to habitat loss. Wildlife displacement will occur when the animals avoid the area due to its changed ecology from increased human activity and noise. The anticipated impacts on the fauna, however, will not be felt in Menengai West area, which has few wildlife species. Clearance of vegetation will expose the soil to wind and water erosion.

Disturbance of the plant community may induce changes in species composition. Soil erosion may be a major hazard in areas outside the caldera floor due to uneven terrain and the loose nature of the volcanic ash soils. Within Menengai West, the surface is covered with lava materials, which are not prone to erosion effects. During drilling and well tests, noise emissions may cause disturbances to the wildlife and vegetation may be contaminated with the heavy metals contained in the drilling and geothermal fluid discharges.

2. Impacts from Solid and Liquid Wastes

Waste products from the drilling process will include brine and drill fluids. Constituents of the brine may contain chemical constituents such as fluorides and arsenic in concentrations that may surpass the wastewater quality criteria for surface disposal in any environment as recommended by Environmental management and coordination (water quality) regulations of 2006. Due to the

potential toxicity and ecotoxicity of the brine, its disposal becomes a major concern in this area as some farmer utilization along the Menengai West as grazing grounds for their livestock. Reinjection of the wastewater is recommended as this method of disposal of wastewater eliminates flow of surface waters and the subsequent soil erosion. It also ensures that soils, vegetation, livestock grazing grounds and any wild animals around the proposed project site are not exposed to the wastewater.

3. **Effects on air quality**

There will be emissions of H_2S and other NCG gases from wells during drilling and flow tests, exhaust gases (CO_2, CO, NOx, SOx, Particulate Matter) and dust from machineries during mobilization and by traffic movement during drilling. The impact of gaseous and particulate emissions on air quality would be short-term and therefore insignificant. Of concern would be H_2S gas due to its odour, which is easily detected by humans at low concentrations in even in areas with natural geothermal manifestations such as fumaroles along the Menenga West project site.

4. **Increased Noise levels**

Noise levels of high frequencies could lead to disturbance of animals and humans and impaired hearing under extreme cases of prolonged exposure. The anticipated noise emission impacts would be limited to the period of well drilling and discharge tests. Noise emission levels at potential receptor sites are expected to be within the WHO maximum allowable limits of 45 dB(A) (at Day time 07.00-22.00 hrs) and 55 dB(A) (at Night time 22.00- 07.00 hrs) for Residential/Institutional/Educational as human settlements are far away from the proposed drill sites and 70 dB(A) (at Day and Night time) for Industrial/Commercial areas.

5. **Visual and Aesthetic Impacts**

Loss of naturalness of the area and set up of the man-made structures like the drilling rig and camps may reduce the visual quality of the area. Creation of these artificial landscapes in the area will be in-significant and short-lived as they will be removed after demobilization of the drilling rigs on completion of the project.

6. **Increased associated risks due to geological activities**

The geological risks expected in a geothermal area include volcanic eruptions, micro seismic (earthquakes) activities, mass movements/ landslides and subsidence. The last eruption in Menengai occurred about 1400 years before present. However, ground-based seismic data collected in the area indicate that there is no risk of a large earthquake or a volcanic eruption anticipated in the area. The sub-surface rocks in Menengai are competent volcanics and therefore the possibility of mass

movements and subsidence are not expected. Therefore, there are no geological risks that might impact the project and communities living in the vicinity of the area.

7. Relocation of Project Affected Persons and Property

Locating the geothermal plant by the proponent and has been done in a way such that it avoids extensive relocation of individuals. The location of the Menengai West Geothermal Plant is in a sparsely populated area along the Ol'Rongai Hills located on the western side of the Menengai Caldera. In cases where relocation is inevitable, implementation of the project will lead to displacement of persons, relocation of structures including houses and social amenities and clearance/cutting down of trees and other vegetation. This necessitates compensation and resettlement of the affected persons and property.

8. Impact on Land Use Patterns

The land affected by the geothermal plant will lead to displacement of the land owners, clearance of vegetation, restricted agricultural activities, and other social-economic activities that will be hindered.

9. Soil erosion

Soil erosion along the project site is expected during the construction phase. Movement of machinery and equipment in the project area will lead to interference of soil structure hence causing soil erosion that may lead to siltation of water ways. However, these activities will be mitigated accordingly.

10. Interference With Water Resources and Drainage

Construction works may affect water resources both in the short-term and in the long-term. Earth movements can result in loose soil particles that are consequently carried by surface water into water sources. In addition, oil/fuel spillages from machinery and water used for cleaning cement off machinery may contaminate ground/surface water. However, measures should be put into place to ensure, the proposed project does not affect the water quality and demand.

11. Vehicular and Human Traffic Impacts

Movement of heavy machinery and equipment during the construction phase, operational phase and decommissioning is expected. These machineries will be used for ferrying workers and materials to the active site while equipment will be used for construction activities at the sites. This may lead to traffic diversions/ congestions in some instances

12. Impacts from Rock Blasting during Project Construction

During construction process, rock blasting to create foundation for the pylons in rocky sections will most likely be necessary. Flying rocks will be a major concern for the blaster. Flying rocks from surface blasting operations can cause serious injury and death to employees and people living within the project area. The process of stone blasting/crushing may be lead to loss of vegetation cover, excessive noise, vibrations and dust. It is a contractual obligation for the contractor and the proponent to protect the communities from these impacts and restore/borrow the sites upon closure This may also pose accident risk to road users, children or animals, dust contaminating goods in roadside markets/homesteads and noise at sensitive receptors (schools and health centers).

13. Emissions and air pollution

Construction and decommissioning phase activities of the proposed project will give generation to dust and exhaust fumes from vehicles and machinery. Dust emissions will emanate from pit excavation activities and movement of machinery in the project area. This directly affects the air quality of the project area.

14. Increase in Social Vices

Overall population of the project area is expected to increase due to an influx of construction workers. This will directly affect the normal social set up of communities living in the project area thereby possible decay of morality, increase in school drop-outs due to available unskilled labour, possible child labour, petty thieves and increased HIV/AIDS incidence and communicable diseases

2.0 SCOPE OF WORK FOR THE FULL ESIA STUDY

Following issuance of a Notification to conduct full ESIA Study on this assignment by NEMA, the scope of the Consultants work shall include:

2.1 Task 1. Detailed Desktop Review

The Consultant shall undertake desktop study of all existing documentation, and previous ESIA reports related to geothermal wells drilling and power plants. This shall include a detailed study of the proposed geothermal wells drilling at the Menengai West Field. The consultant shall then concisely describe the project location including its geographical, ecological and the general layout of associated infrastructure including maps at appropriate scale where necessary.

2.2 Task 2. Description of the Baseline Environment

The Consultant shall collect, collate and present baseline information on the environmental characteristics of the proposed project site. This description should involve but not limited to:

a) *Physical environment* (topography, land cover, geology, climate and meteorology, air quality, hydrology, etc.).
b) *Biological environment* (i.e. flora and fauna types and diversity, endangered species, sensitive habitats etc.)
c) *Social and cultural environment,* including present and projected. Where appropriate i.e. population, land use, planned development activities, community social structure, employment and labour market, sources and distribution of income, cultural/religious sites and properties, vulnerable groups and indigenous populations etc.)
d) *Economic activities* i.e. agriculture, livestock, small scale industries etc.

2.3 Task 3. Legislative and Regulatory Framework

The Consultant shall identify and describe all pertinent regulations and standards (both local and international) governing the environmental quality, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues at the local, national and international levels. Compliance issues shall also be stated. Thereafter, the Consultant shall identify the project activities that should comply with the identified regulations. Special emphasis should be given to:

1. IFC Environmental and Social Performance Standards (PS)2012 including:
    - PS1: Social and Environmental Assessment and Management Systems
    - PS2: Labor and Working Conditions and ILO Core Labour Standards
    - PS3: Pollution Prevention and Abatement

- PS4: Community Health, Safety and Security
- PS5: Land Acquisition and Involuntary Resettlement
- PS6: Biodiversity Conservation and Sustainable Natural Resource Management
- PS7: Indigenous Peoples
- PS8: Cultural Heritage

2. World Bank Group's Environmental and Health and Safety Guidelines including:
   - General EHS Guidelines
   - EHS Guidelines for Geothermal Power Generation
   - World Bank Safeguard Policies

3. KfW Development Bank Sustainability Guidelines/Standards 2014
4. IFC General Guideline on Environment, Health and Safety 2007
5. IFC Environment, Health and Safety for Geothermal Power Generation 2007
6. French Development Fund (AFD) Environmental Assessment Guidelines 1992

2.4 Task 4. Determination of Impacts of Project Facilities and Activities

The Consultant shall analyse and describe all significant changes expected due to the proposed project. These shall encompass environmental, ecological and social impacts, both positive and negative, as a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions discussed in Task 2.

The Consultant shall make a prioritization of all concerns identified and differentiate between short medium, long-term and cumulative impacts during construction, operation and decommissioning. The Consultant shall also identify both temporary and permanent impacts. A detailed outline and discussion of specific conditions that might affect the environment which are unique to the type of facility and/or operation being audited shall be provided.

During the analysis, the Consultant shall consider both biophysical and socio-economic factors that shall include the impacts of: Population change and migration; Socio-economic characteristics of the difference target groups along the transmission line; Forms of social organization and co-operation; Physical and social infrastructure; Change in economic activities; Development resources; Vegetation clearance; Mechanical disturbance; Removal of structure /sites; Relocation and resettlement; Effects on flora and fauna; Air quality; Water quality; Improved access; Accident rates; and Visual/aesthetic change.

2.5 Task 5: Occupational Health and Safety Concerns

The Consultant shall analyze and describe all occupational health and safety concerns brought about by activities during all the phases of the project. The Consultant shall make recommendations on corrective and remedial measures to be implemented under the environmental management plan.

2.6 Task 6: Development of Environmental and Social Management Plans

The Consultant shall develop a comprehensive environmental management plan. The plan shall recommend a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or maximize socio -economic benefits. The Consultant should provide cost outlays for the proposed mitigation measures as well as their institutional and financial support, time frame and responsibility. This shall be provided for in all phases of the project.

2.7 Task 7: Development of Land Acquisition & Compensation Plans (LACP) and Resettlement Action Plan (RAP)

The consultant shall undertake a socio-economic survey of the communities surrounding the proposed project. This shall include:

- Conducting a census of the affected persons and identification of vulnerable groups and indigenous populations
- Developing an eligibility criteria and establishment of a cut-off date for LACP
- Evaluating and preparing an inventory of the affected properties
- Evaluating all other socio-economic costs
- Conducting public consultations/awareness creation of the relevant stakeholders, taking into consideration the gender concerns and vulnerable groups
- Identifying alternative sites, to the affected land parcels
- Developing adequate livelihood restoration mechanisms
- Preparing the LACP implementation costs
- Preparation of an implementation schedule
- Developing a monitoring and evaluation methodology
- Consider the relevant legal provisions for land acquisition and resettlement during preparation of an appropriate Land Acquisition & Compensation Plans (LACP) and resettlement action plan
- Preparing and submitting a detailed Land Acquisition & Compensation Plans (LACP) and Resettlement Action Plan (RAP)
- Developing a conflict resolution mechanism

2.8 Task 8: Development of Monitoring Plan

The Consultant shall give a specific description, and technical details, of monitoring measures for both ESMP and RAP, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, and definition of thresholds that shall signal the need for corrective actions as well as deliver a monitoring and reporting procedure. The consultant shall provide a time frame and implementation mechanism, staffing requirements, training and cost outlays.

2.9 Task 9: Comparison

The consultant shall undertake a comparison of all the project alternatives including location, technology etc.

2.10 Task 10: Study Reports

The output shall be an Environmental and Social Impact Assessment report and a Resettlement Action Plan (RAP)/ Land Acquisition & Compensation Plans (LACP) prepared in accordance with the regulatory provisions. The report shall be in the English Language and has to be clear and concise. The reports shall also be in a format acceptable to local competent authorities, international environmental standards and development partners. The consultant shall present the reports to the National Environment Management Authority (NEMA) for approval in the required number of copies.

2.11 Task 11: ESIA Update Report Presentation and Peer Review

The consultant shall present the draft report which may be subject to a peer review. In the event that any rectification is to be made on the report, the consultant shall bear any applicable costs.

2.12 Task 12: Approval

The Consultant shall present the report prepared under Task 10 for approval by the relevant authorities. The Consultant shall be responsible for making any modifications that the authorities may demand before approval of the report.

2.13 Task 13. Counterpart Staff

For the purpose of capacity building the consultant shall undertake the study together with counterpart staff seconded by the Client i.e. Environmental Scientists and Community Relations Officers.

3.0 WORK SCHEDULE

The assignment will be carried out in eight (8) weeks and the reports submitted to NEMA for approval and a license issued within three (3) months. Figure 3.1 show our work schedule for conducting the assignment.

Activity	W1	W2	W3	W4	W5	W6	W7	W8
Desk Review								
Consultations and Site assessment								
Environmental Determinations								
Development of LACP and RAP								
Data Management and Reporting								

Figure 3.1: Work schedule

4.0 TEAM COMPOSITION

4.1 Professional staff

The following key staff will undertake the assignment

Name	***Qualification***	***Proposed Position***
Prof Lawrence Gumbe	Ph.D Environmental Engineering	Lead Consultant/Team Leader
Abdul Ramadhan Odhiambo	MSc. and B.A. Land Economics (Hons)	Valuer
Dr. Beneah Manyuru Mutsotso	Ph.D and an MA Sociology	Sociologist/ Socioeconomist
Mr. James Richard Otieno Opollo	BSc. Chemistry	Safety and Health Specialist (SHE)
Dr. Dulo Simon	PhD. Civil Engineering	Civil Engineer
Dr. Agnes W. Muthumbi	Ph.D Biology	Ecologist
Dr. Peter Omenda	Ph.D Geological science	Geothermal Energy Specialist

4.2 Support staff

We have also proposed the following support staff to help the key staff in accomplishing the study.

Name	**Qualification**	**Tasks Assigned**
Mr. Erick Orwa (Registered Associate Expert)	B.Sc Environmental and Biosystems Engineering	Data Collection and Analysis
Ms.Hellen Mwai (Registered Associate Expert)	MSc. Environmental Engineering	Data Collection and Analysis
Mr Amos Kola (Registered Associate Expert)	M.Sc Environmental	Data Collection and Analysis

5.0 CURRICULUM VITAE FOR KEY PERSONNEL

5.1 Prof. Lawrence Gumbe: Lead Consultant/Team Leader

Proposed Position: **Lead Consultant/Team Leader**
Name of Firm: Log Associates Ltd., Kenya
Name of Staff: Eng. Prof. Lawrence Gumbe
Profession: Environmental Engineer
Date of Birth 1957
Years with Firm: Twenty- Four (24) **Nationality:** Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Chartered Environmentalist, Society for the Environment (SocEnv)
- Member, American Society of Agricultural and Biological Engineers (ASABE)
- Member, American Society of Civil Engineers (ASCE)
- Member, American Society of Heating, Ventilating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- Member, American Society of Mechanical Engineers (ASME)
- Member, Architectural Association of Kenya (AAK)
- Member, Association of Consulting Engineers of Kenya (ACEK)
- Member, Environment Institute of Kenya (EIK)
- Member, Institution of Agricultural Engineers, United Kingdom (IAgrE)
- Member, Institution of Engineers of Kenya (IEK)
- Member, Kenya National Academy of Sciences (KNAS)
- Member, Kenya Society of Agricultural Engineers (KSAE)
- Registered Lead Expert (No. 0831), National Environmental Management Authority (NEMA)
- Registered Professional Consulting Engineer (No. E149), Engineers Board of Kenya (EBK)

KEY QUALIFICATIONS

Eng. Prof. Gumbe holds a **PhD degree** from Ohio State University, USA, an **MSc degree** from Cranfield University, England and a **BSc degree** from the University of Nairobi, Kenya and is registered with various professional bodies. He is a renowned **Chartered Environmentalist**, from the Society for the Environment (SocEnv). Prof. Gumbe is also a **Lead Expert** with NEMA and has been proposed as the **Lead Consultant/ Team Leader** for this assignment due to his outstanding experience in Environmental and Social Impact Assessments especially on energy related assignments.

Eng. Prof. Gumbe has had a long and distinguished career in consultancy, research and education. He was instrumental in the establishment of the Department of Environmental and Biosystems Engineering at the University of Nairobi. He has been a **Project Director**, assuring quality and overall

direction and coordination, on many projects. He has a wide consultancy experience spanning **over thirty (30) years** in the fields of **environment management and monitoring**, **engineering, energy**, economics and training, among others.

He was the Environmental Expert for the Environmental and Social Impact Assessment (ESIA) and resettlement action plan (RAP) Study for Nyeri water and supply company (NYEWASCO) in development of ESIA report for pipeline extension, MUWASCO in development of ESIA and RAP for Maragua Water Pipeline project. He was also involved in the Proposed **Garsen – Hola – Garissa 220kv And Garissa– Wajir 132kv High Voltage Transmission Line** which was aimed at identifying significant environmental and social impacts associated with the proposed project and recommended appropriate mitigation measures for integration in all phases of the projects cycle. In 2014, Eng. Prof. Gumbe was the Environmental Expert for the Feasibility Study, Environmental & Social Impact Assessment (ESIA) and Design for Briquette Manufacturing Plant for the Lake Basin Development Authority.

Recently in 2016, he was the Environmental Expert for the **Nairobi Ring & Associated Substations- Implementation of the Environmental and Social Management Plans (ESMPs)** for **400kV Suswa - Isinya Transmission line** in Kenya (Isinya, Athi River and Kimuka) Substations an assignment that was done in association with Power Engineers.

He was also the Environmental Expert for the Environmental and Social Impact study for the proposed **Silale – Rongai 400kV double circuit transmission line** in 2014**.**

In 2013, Eng. Prof. Gumbe was the Environmental Expert for an assignment that entailed an Updated Resettlement Action Plan (RAP) and Detailed Census for the **Kenya-Ethiopia Border to Log Logo (195km-500kV) –Transmission Line (Lot 1)** and **Log Logo to Kinamba (195km -500kV) – Transmission Line (Lot 2) for the Kenya Electricity Transmission Company Limited (KETRACO)**. He was also the Environmental Expert for an Up-dated Resettlement Action Plan (RAP) and Schedule for the **132 km Lessos- Tororo 400Kv in 2012 for the Kenya Electricity Transmission Company Limited (KETRACO).**

Prof Gumbe is the Chief Executive Officer of LOG Associates limited. Due to his vast experience and expertise in different fields we have proposed him as the **Lead Consultant/ Team Leader** for this assignment.

EDUCATION:

Date	Institution	Qualification
1987	Ohio State University Columbus, Ohio, USA	Ph.D.
1981	Cranfield University, Silsoe College, England	M.Sc.
1980	University of Nairobi, Kenya	B.Sc.

EMPLOYMENT RECORD:

Date	Position
Mar. 1994 - Date	Chief Executive Officer, Log Associates: (Consulting Engineers, Economists, Agriculturalists and Planners. Nairobi, Kenya)
December 2014- Date	Professor, Biosystems and Environmental Engineering, Technical University of Kenya
October 2014- Date	Adjunct Professor, Civil Engineering Kenyatta University
February 2014- December 2014	Adjunct Associate Professor, Civil and Environmental Engineering Technical University of Kenya
July 1998 -	Associate Professor, Department of Environmental and Biosystems Engineering, University of Nairobi
Oct 1989–Mar.1995	Associate, Professional Consultants, Consulting Engineers, Nairobi, Kenya
Mar. 2005 – 2007	Director of Programmes, African Centre for Technology Studies
Mar. 2003 -Mar. 2006	Chairman, Department of Environmental and Biosystems Engineering, University of Nairobi
Mar.1998 – Mar.2000	Chairman, Department of Agricultural Engineering, University of Nairobi
Apr.1995 – Aug.1997	Visiting Scientist, Silsoe Research Institute, England. Made various visits.
Nov. 1989 – Jul.1998	Senior Lecturer, Department of Agricultural Engineering, University of Nairobi
Sept.1987 – Nov. 1989	Lecturer, Department of Agricultural Engineering, University of Nairobi
Feb.1989 –Sept.1989	Part-time Lecturer, Appropriate Technology Centre, Kenyatta University
Sept.1984 –Sept.1987	Ph.D. Student and Teaching Assistant, Ohio State University, Columbus, Ohio U.S. A
Oct.1981 –Sept. 1984	Tutorial Fellow, Department of Agricultural Engineering, University of Nairobi
Oct.1980 –Sept. 1981	M.Sc. Student, Cranfield University, England
Jul. 1980 – Oct. 1980	Coffee Factory Engineer, Ministry of Agriculture, Nairobi
Nov. 1976 –Oct. 1977	Accounts Clerk, Ministry of Agriculture, Kisumu

KEY EXPERIENCE SUMMARY:

Name of assignment or project: Development of Kenya National Environmental Performance Index.
Year: 2017/2018
Location: Environmentalist
Client National Environment Management Authority (NEMA
Positions held: Environmental Expert / Lead Expert
Main project features: The main objective of the assignment was to develop an Environmental Performance Index to be used as an indicator of the national and county levels performance in implementing environmental management initiatives, provision of baseline data, provision of recommendations on the required infrastructure for hosting and sharing of the Environment Performance Index and conducting trainings on the development and use of the Environment Performance Index targeting mainly those drawn from implementing partners of the GGEP.
Activities performed: Assist in the development of the Environmental Performance Index and hence providing baseline(s) information, provided recommendations on the required infrastructure for hosting and sharing of the Environmental Performance Index; and undertook trainings on the development and use of the Environmental Performance Index targeting mainly those drawn from implementing partners of the GGEP

Name of assignment or project: Consultancy services to carry out an Environmental and Social Impact Assessment (ESIA) of Maragua Water Supply Project
Year: 2017
Location: Muranga County; Maragua
Client: Murang'a Water & Sanitation Company (MUWASCO):
Positions held: Environmental Expert / Lead Expert
Main project features: The main objective of the ESIA study was to identify significant environmental and social impacts associated with the proposed water supply project and recommend appropriate mitigation and enhancement measures for integration in all phases of the project. The proposed project traversed across Kiharu and Muranga South Sub Counties. The proposed project would receive water from the 450mm diameter Kiawambeu - Kiharu mainline supply and will be constructed along the existing public road reserve and traverse some few parcels of private land.
Activities performed: Identifying significant environmental and social impacts associated with the proposed projects and recommend appropriate mitigation measures for integration in all phases of the projects cycle (Kiharu and Murang'a South Sub Counties), Did a detailed resettlement action plan to resettle the affected Project Affected People (PAPs) where the proposed water pipeline was to traverse (RAP was a component of this study by WSTF), Developed an Environmental Management Plan that described in detail the mitigation measures to be carried out, costing, scheduling and responsibility of such measures, and a detailed monitoring process and its schedule and assisted in Reporting

Name of assignment or project: Environmental and Social Impact Assessment for the Proposed Sewer Extension Projects
Year: 2017
Location: Nyeri
Client: Nyeri Water and Sewerage Company (NYEWASCO)

Positions held: Environmental Expert / Lead Expert
Main project features: The main objective of the Environmental and Social Impact Assessment (ESIA) study was to identify significant environmental and social impacts associated with the proposed sewer extension projects and recommend appropriate mitigation measures for integration in all phases of the projects cycle. The proposed sewer extension projects were in Ruring'u, King'ong'o (Gatende), Ngangarithi and Kamakwa (Kandara and Mumbi) estates in Nyeri Town Sub County.
Activities performed: Description of the baseline environmental conditions of the project area, Description of the proposed project, Detailing provisions of the relevant laws and regulations, Identification of any adverse impacts to the environment anticipated from the proposed projects with various stakeholders, Identification of appropriate mitigation measures for adverse impacts and Provision of an Environmental and Social Management Plan and a Monitoring Plan.

Name of assignment or project: Nairobi Ring & Associated Substations- Implementation of the Environmental and Social Management Plans (ESMPs) for 400kV Suswa - Isinya Transmission line: Isinya, Athi River and Kimuka Substations (with Power Engineers).
Year: 2014- 2016
Location: Nairobi and Kajiado Counties
Client: Kenya Electricity Transmission Company (KETRACO)
Positions held: Environmental Expert
Main project features: Resettlement Action Plan (RAP) Implementation, Implementation of Environmental and Social Management Plans (ESMP)
Activities performed: Monitoring and Evaluation of compliance to Environment, Health and Safety requirements

Name of assignment or project: Environmental and Social Impact study for the proposed Silale – Rongai 400kV double circuit transmission line
Year: 2014
Location: Baringo and Nakuru Counties, Kenya
Client: Kenya Electricity Transmission Company (KETRACO)
Positions held: Environmental Expert
Main project features: Environmental and social impact study
Activities performed: Overall coordination, field assessments, development of ESMP and reporting

Name of assignment or project: Environmental & Social Impact Assessment (ESIA) study for securing of KENGEN boundaries buffer zones at Gitaru, Kamburu and Kindaruma Hydropower Plants
Year: 2013
Location: Gitaru, Kamburu and Kindaruma Hydropower Plants
Client: Kenya Electricity Generation Company (KenGen)
Positions held: Project Director / Environmental Expert
Main project features: Environmental and social impact study, feasibility study.

Activities performed: Overall Coordination on data collection, analysis and reporting

Name of assignment or project: Environmental and Social Impact Assessment of the renewal of KPLC Juja Road 132/66/11 kV Substation from an Insulated Switchgear System (ISS) to a Modular Switchgear System (MSS)
Client: Kenya Power and Lighting Company (KPLC)
Year: 2013,
Positions held: Environmental Expert
Main project features: ESIA study
Activities Performed; Overall Coordination on data collection, analysis, documentation, ESMP development and reporting
Location: Nairobi, Kenya

Name of assignment or project: Updated Resettlement Action Plan (RAP) and Detailed Census Kenya-Ethiopia Border to Kinamba (195km) 500KV Transmission Line.
Year: 2013
Location: Marsabit County
Client: Kenya Electricity Transmission Company (KETRACO)
Positions held: Team leader/Project Director
Main project features: Resettlement Action Plan (RAP) Study.
Activities performed: Account of project affected persons (PAPs), Account of Nature and category of affected structures and description of the environment

Name of assignment or project: Up-dated Resettlement Action Plan (RAP) and Schedule for the 132 Km Lessos- Tororo 400Kv Transmission line
Year: 2012
Location. Nandi, Bungoma and Busia Counties
Client: Kenya Electricity Transmission Company (KETRACO)
Positions held: Project Director
Main project features: Resettlement Action Plan (RAP) Study.
Activities performed: Account of project affected persons (PAPs) and description of the environment
Name of assignment or project: Feasibility Study, Environmental & Social Impact Assessment (ESIA) and Design for Briquette Manufacturing Plant
Year: 2013 - 2014,
Location: Lake Victoria Basin
Client: Lake Basin Development Authority
Positions held: Team Leader/ Environmental Expert
Main project features: Feasibility study, design, ESIA study
Activities Performed; Overall Coordination on data collection, analysis, documentation, ESMP development and reporting

Name of assignment or project: Provision of Oversight Management of Medium-Term ASAL Programme (MTAP)
Year: 2013 - 2014,
Location: Lamu, Tana River, Isiolo, Marsabit, Wajir and Garissa
Client: Water Services Trust Fund (WSTF
Positions held: Team Leader/ Environmental Expert
Main project features: Water and sanitation facilities design and construct supervision
Activities Performed; Overall Coordination on design review, oversight supervision, documentation and reporting

Name of assignment or project: Environmental Impact Assessment and Hydro-geological survey in Bartabwa
Client: World Vision Kenya
Positions held: Team Leader/ Environmental Expert
Main project features: Hydrogeolocal and Environmental Assessment
Activities performed: Overall coordination, field assessments, environmental and social impact assessment, preparation of ESMP and reporting IPA
Year: 2011
Location: Baringo County

Name of assignment or project: Environmental and Social Impact study for the proposed Garsen–Hola–Garissa 220kv and Garissa–Wajir 132kv high voltage transmission lines
Client: Kenya Electricity Transmission Company (KETRACO)
Positions held: Environmental Expert
Main project features: Environmental and social impact study
Activities performed: Overall coordination, field assessments, development of ESMP and reporting
Year: 2013 - 2014
Location: Garsen, Hola and Wajir, Kenya

Name of assignment or project: Water and Sanitation Service Improvement Project (WaSSIP) Environmental Management and Safeguards
Year: 2013
Location: Coastal Region
Client: Coast Water Services Board
Positions held: Team Leader/Environmentalist
Main project features: Midterm review and Evaluation
Activities Performed; Overall Coordination on data collection, analysis, documentation and reporting

Name of assignment or project: Water and Sanitation Service Improvement Project (WaSSIP)

Environmental Management and Safeguards
Client: Coast Water Services Board Kenya
Year: 2012 - 2013
Location. Coast region Kenya
Position Held: Environmental Expert
Main project features: Service improvement, Environmental management and safeguards
Activities performed: Environmental and social impact analysis

Name of Project: -Environmental Impact Assessment and Hydro-geological survey in Isiolo Oldonyiro IPA
Year: 2011
Location: Isiolo County
Client: World Vision Kenya
Position Held: Environmental Expert
Location: Isiolo County
Main project features: Hydrogeolocal and Environmental Assessment
Activities Performed: Overall coordination, field assessments, environmental and social impact assessment, preparation of ESMP and reporting

Name of assignment or project: Environmental & Social Impact Assessment for the proposed construction of an off-grid diesel power generating station in Faza island, Lokori and Loukitang
Year: 2010,
Location: Coastal Region
Client: Rural Electrification Authority (REA)
Positions held: Project Director
Main project features: Environmental and social impact assessment
Activities Performed; Overall Coordination on data collection, analysis, documentation, ESMP development and reporting

Name of assignment or project: Environmental & Social Impact Assessment of the proposed Olkaria-Sotik, Kisii-Sondu, Kisii-Awendo 132kV Transmission Line
Year: 2009,
Location: Nyanza , Kenya
Client: Kenya Power and Lighting Company (KPLC)
Positions held: EIA expert
Main project features: Environmental and social impact assessment
Activities Performed; Overall Coordination on data collection, analysis, documentation, ESMP development and reporting
Name of assignment or project: A study to update the Environmental and Social Impact Assessment, (ESIA) for the 400 kV Mombasa - Nairobi Transmission
Year: 2009

Location: Kenya
Client: Rural Electrification Authority (REA)
Main project features: literature review, personal interviews and consultative meetings together with public participation of stakeholders and thereafter development of a detailed Environmental and Social Management Framework
Position Held: Power Systems Expert
Activities performed: Consultation and advising on hazards and mitigation

Other Relevant Experiences

Name of assignment or project: Provision of Oversight Management of Medium-Term ASAL Programme (MTAP)
Year: 2013 - 2014,
Location: Lamu, Tana River, Isiolo, Marsabit, Wajir and Garissa
Client: Water Services Trust Fund (WSTF
Positions held: Team Leader
Main project features: Water and sanitation facilities design and construct supervision
Activities Performed; Overall Coordination on design review, oversight supervision, documentation and reporting

Name of assignment or project: Water and Sanitation Service Improvement Project (WaSSIP) Environmental Management and Safeguards
Client: Coast Water Services Board Kenya
Year: 2012 - 2013
Location. Coast region Kenya
Position Held: Environmental Expert
Main project features: Service improvement, Environmental management and safeguards
Activities performed: Environmental and social impact analysis

Name of Project: -Environmental Impact Assessment and Hydro-geological survey in Isiolo Oldonyiro IPA
Year: 2011
Location: Isiolo County
Client: World Vision Kenya
Position Held: Environmental Expert
Location: Isiolo County
Main project features: Hydrogeolocal and Environmental Assessment
Activities Performed: Overall coordination, field assessments, environmental and social impact assessment, preparation of ESMP and reporting

Name of assignment or project: Environmental Impact Assessment and Hydro-geological survey in Bartabwa
Client: World Vision Kenya
Positions held: Team Leader
Main project features: Hydrogeolocal and Environmental Assessment
Activities performed: Overall coordination, field assessments, environmental and social impact assessment, preparation of ESMP and reporting IPA
Year: 2011
Location: Baringo County

Name of Assignment: Long Term Intervention Works in Kisii Town-survey, detailed design and development of tender documents
Client : Lake Victoria South Water Services Board
Year: 2010
Positions held: Team Leader/ Environmentalist
Activities undertaken: The main objective of this assignment was to assist in the design of water and sewerage/sanitation infrastructure including the proposition of the social economic components relating to the viable formation and operation of local groups to be involved in the furtherance of pro-poor objectives of the program.

Name of Assignment: Long Term Intervention Works in Bondo Town-survey, detailed design and development of tender documents
Client: Lake Victoria South Water Services Board
Year: 2010
Positions held: Team Leader/ Environmentalist
Activities undertaken: The main objective of this assignment was to assist in the design of **water and sanitation infrastructure** including the proposition of the social economic components relating to the viable formation and operation of local groups to be involved in the furtherance of pro-poor objectives of the program.

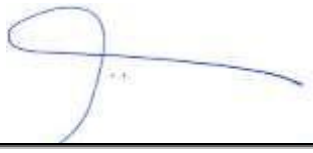
Name of Assignment: Baseline survey on water supply and sanitation coverage in the informal settlements in towns in Lake Victoria South Water Services Board
Client: Lake Victoria South Water Services
Year: 2009
Positions held: Team Leader/ Environmentalist
Activities undertaken: The objective of the project was to establish the baseline situation on water and sanitation coverage in the informal settlements towns within the jurisdiction of the LVSWSB

LANGUAGES:

	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Kiswahili	Excellent	Excellent	Excellent

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Name of Expert	Signature	Date
Eng. Prof. Lawrence Gumbe		10 October 2018

Staff Member or authorized official from the firm	Signature	Date
Ezekiel Oranga		10 October 2018

5.2 Abdul Ramadhan Odhiambo: Valuer

Proposed Position: **Valuer**
Name of Firm: Log Associates Ltd., Kenya
Name of Staff: Abdul Ramadhan Odhiambo
Profession: Valuer
Years with Firm: Thirteen (13) **Nationality:** Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Licensed Valuer by the Valuers' Registration Board, 1999
- Registered Valuer, 1999
- Registered Estate Agent, 1998
- Full Member of the Institution of Surveyors of Kenya, 1997
- Associate Member of the Institution of Surveyors of Kenya, 1995

KEY QUALIFICATIONS

Mr. Abdul holds an **MSc**. in Entrepreneurship from Jomo Kenyatta University of Agriculture and Technology. He also holds a B**.A. Degree in Land Economics (Hons) from the University of Nairobi**, and a post graduate diploma of the **Institution of Surveyors of Kenya**. He is a Registered Valuer and a Registered Estate Agent with a professional carrier spanning over fifteen years. He has been a major player in the valuation fraternity. Mr Abdul has previously worked as an estates officer in the University of Nairobi, his duties included: Valuation for rent and insurance purposes, Supervision of capital construction projects , maintenance of furniture and equipment's register, Supervision of maintenance and repair works to buildings, Lease of University premises, administration of leases, preparation and maintaining a lease register of leased premises.

He has been our team leader in various **RAPs** including in the KETRACO's **Detailed Resettlement Action Plan (RAP)** for the 127 Km Lessos- Tororo 220 Kv Transmission line for KETRACO. He was also the **Team Leader i**n the **Resettlement Action Plan** *and* Environmental and Social Impact Study for the proposed construction of an off-grid diesel power generating station in Faza Island, Lokori and Loukitang in 2010.

He was the **Team Leader** in Updating the **Resettlement Action Plan (RAP), Environmental and Social Impact Assessment (ESIA),** Preparing of the Environmental and Social Management Plan (ESMP) for the proposed Mombasa - Nairobi 400 kV Transmission Line (400km). He was also the **Land Economist** in the**Resettlement Action Plans (RAP)** and Environmental & Social Impact Assessment of the proposed 220 kV Olkaria - Sotik (190 km) transmission line, Kisii - Sondu (45km) and Kisii - Awendo (44km) 132 kV transmission lines and in the **Resettlement Action Plans (RAP),** and **Environmental and Social Impact Assessment for Rabai -Diani 132 kV and Arusha - Embakasi 330 kV** transmission lines and associated substations.

DETAILED TASKS ASSIGNED:

- Preparation of an inventory of losses and a detailed entitlement matrix.
- Description of the total land within the scope at Menengai that will be affected by the project.
- Baseline description of land tenure, land use patterns and transfer systems
- Real Property/ Land Valuation.
- Determine the valuation of land and compensation for losses
- Identify alternative sites and selection of resettlement sites, site preparation and relocation
- Calculate compensation values
- Review compensation framework including country laws and regulations
- Reporting

EDUCATION:

Qualification	Institution	Year
Master of Science in Entrepreneurship	Jomo Kenyatta University of Agriculture and Technology	2015
B.A. Land Economics (Hons),	University of Nairobi	1994
Post Graduate Diploma of the Institution of Surveyors of Kenya		1997

EMPLOYMENT RECORD:

2005 to date: Associate consultant, Log Associates Limited.

2005 to date: Managing Director, Milligan International Limited, Registered Valuers, Estate and Managing Agents

2003-2005 Estates Officer, University of Nairobi
The schedules of duties as an Estates Officer include but not limited to:

Preparation of graduation grounds in readiness for the graduation ceremony.

Monitor usage, payments for and queries/problems pertaining to water and electricity.

Valuation for rent and insurance purposes.

Lease of University premises, administration of leases, preparation and maintaining a lease register of leased premises.

Office accommodation issues including allocation and advise on optimum utilization of offices and teaching space.

Rent payment for University houses.
Landscaping of University grounds.

Maintenance of furniture and equipment's register.

Supervision of staff in estates registry and casual workers

Supervision of maintenance and repair works to buildings

Supervision of capital construction projects

1994 to 2002: Joined Milligan and Co. Ltd- the oldest Valuation Firm in Kenya rising from a Valuer Trainee to Chief Valuer.

Responsible for all the Valuation Staff in the Office.Has directed field inspections of all major valuations including Land & Buildings, Plant and Machinery and office furniture and equipments Valuations.

Responsible for the training/pupilage of all the newly recruited Company Valuers preparing for the Institution of Surveyors of Kenya Exams.

KEY EXPERIENCE SUMMARY:

2014	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Nairobi Ring and Associated Stations-EMPs and RAPs implementation for Suswa – Isinya Transmission line, Suswa, Isinya Athi River Koma Rock and Ngong Substation (with Power Engineers)
2013	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Updated Resettlement Action Plan (RAP) and Detailed Census Kenya-Ethiopia Border to Log Logo (195km) 500KV Transmission Line
2013	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Updated Resettlement Action Plan (RAP) and Detailed Census for Log Logo to Kinamba (195km) 500KV Transmission Line
2013	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Detailed Resettlement Action Plan (RAP) for the 33 Km Ishiara- Kieni, 153Km Mwingi- Kitui- Wote- Sultan Hamud 132Kv Transmission line

2012	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Detailed Resettlement Action Plan (RAP) for the 132 Km Lessos – Tororo 400Kv Transmission line
2012	**Valuation Expert**	**Kenya Electricity Generating Company (KenGen)** Environmental and Socio-Economic Impact Assessment (ESIA) for Securing KenGen Boundaries Buffer Zones at Gitaru, Kamburu and Kindaruma Hydropower Plants
2011	**Valuer**	**Kenya Electricity Transmission Company (KETRACO)** Detailed Resettlement Action Plan (RAP) for the 428 Km for Loyangalani-Suswa 400Kv Transmission line
2011	**Valuer**	**Kenya Electricity Transmission Company (KETRACO** Detailed Resettlement Action Plan (RAP) for the 127 Km Lessos- Tororo 220 KV Transmission line
2010	**Valuation Expert**	**Kenya Power and Lighting Company** Environmental and Social Impact Assessment (ESIA) of the renewal of Juja Road 132/66/11 kV Substation from an Insulated Switchgear System (ISS) to a Modular Switchgear System (MSS). ESIA and RAP conducted in line with NEMA and World Bank guidelines
2010	**Valuer**	**Rural Electrification Authority (REA)** Environmental and Social Impact Assessment (RAP) and Resettlement Action Plan (RAP) for the proposed construction of an off-grid diesel power generating station in Faza Island, Lokori And Loukitang. ESIA and RAP developed in line with NEMA and World Bank guidelines
		Kenya Sugar Board The Sugar Development Fund (SDF) Impact Assessment Study
2009	**Valuer**	**Kenya Power and Lighting Company** Environmental and Social Impact Assessment and Resettlement Action Plans (RAP) of the proposed Olkaria-Sotik (190 km), Kisii-Sondu (45km), Kisii-Awendo (44km) 132kV transmission lines. Assessment undertaken in line with NEMA and World Bank guidelines
2009	**Valuer**	**Kenya Power and Lighting Company** Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP) and a Resettlement Action Plan (RAP) for the 400 kV Mombasa - Nairobi transmission line. A total of 450km assessed

in line with NEMA and World Bank guidelines

2007 Valuer **Kenya Power and Lighting Company**
Environmental and Social Impact Assessment for Rabai - Diani 132 kV and Arusha – Embakasi 330 kV transmission lines and associated substations. A total of 462km assessed in line with NEMA and World Bank guidelines.

2007 Valuer **Kenya Power and Lighting Company**
Environmental and Social Impact Assessment for Chemosit - Kisii and Kamburu - Meru 132 kV transmission lines and associated substations project. A total of 160km assessed in line with NEMA and World Bank guidelines.

2005 Valuer **Kenya Power and Lighting Company**
Environmental Impact Assessment of eight (8) proposed distribution substations in Nairobi, Kisumu, Kapsabet, Nyeri, Meru, Nakuru and Nyahururu lines under the loss reduction projects of the Power Sector Recovery Programme. The assessment conformed to NEMA and World Bank Guidelines.

Other Relevant Experience

2013	Kenya Orient Insurance Co. Ltd	Valuation of company properties in Nairobi (including part of Capitol Hill Towers) and Mombasa for book purposes
2001-2013	Guardian Bank Ltd	Various properties for mortgage purposes. Total valuation now running into billions.
2012	East Africa Spectre Ltd	Valuation of gas cylinders manufacturing plant in Nairobi
2010	Africa Expeditions Limited	Valuation of copany assets in Kenya (Nairobi, Lokichogio) and Southern Sudan (Rumbek, Wao and Juba.
2005-2010	Dubai Bank Limited	Valuation of furniture and office equipment for take over purposes. Several mortgage valuations
2008-2010	Consolidated Bank of Kenya	Valuation of Consolidated Bank House and Contrast House, Nairobi totalling Ksh.550 million.
2009	Parklands Sports Club	Valuation of all the club's assets comprising furniture, fixtures, computers, motor vehicles and equipment like kitchen, swimming pool, gymn and sauna equipment.
2008	Melck Street Management (Pty)Limited	Valuation of factory for manufacture of Weetabix in Industrial area for book purposes
2008	African Fund for	Valuation of the Giraffe Centre on an expansive 100-

	Endangered Wildlife Kenya	acre parcel in Langata, Nairobi for book purposes
2007	Islamic School Ngara	Valuation of school in Ngara for Insurance purposes
2001-2007	ABC Bank Limited	Valuation of the Bank's buildings in Westlands, City centre and industrial area for book purposes Several mortgage valuations
2007	Wambua Kilonzo & Co. Adv.	Valuation of several plots in Makutano Market for compensation purposes under compulsory acquisition for expansion of Mombasa Road into a dual carriageway
2007	Liaison House	Valuation of partitions, furniture and office equipment worth Ksh.12.3 million.
2007	Mombasa Tiles & Bricks Ltd	Valuation of plant and machinery for mortgage purposes
2007	Muhoroni Sugar Factory	Valuation of the factory complex but in charge of buildings and furniture and office equipment.
2005	Superfoam Limited	Valuation of land, buildings, office furniture and equipment, plant and machinery of a foam and polythene making factory in Ruiru including motor vehicles for mortgage purposes
2005	Tamarind management Limited	Valuation of Tamarind Hotel, Nairobi, Carnivore Restaurant, The Splash and Tamarind Hotel, Mombasa. Total value was Kshs.250 million
2005	Metal Crowns Limited	Valuation of an extensive crown and bottle manufacturing factory in Nairobi for book and mortgage purposes.
2004	East African Chemical Factory, Webuye	Valuation of plant and machinery for book purposes
2004	Tamarind Group of Hotels	Valuation of entire asset portfolio including The Carnivore, Tamarind Hotel Mombasa, Tamarind Cottage and Tamarind Restaurant for mortgage purposes
2003	Global Gases Limited	Valuation of plant and machinery for mortgage purposes
2003	Track It Limited	Acquisition and valuation of several sites along Nairobi-Kisumu highway for erecting signal masts.
2003	Block Hotels Limited	Valuation of all movable assets for both book and insurance purposes.
2000	Chandaria Industries	Valuation of land, buildings, plant and machinery for book and mortgage purposes
2000	Miwani Sugar Factory	Valuation of the company assets but in charge of motor vehicles and furniture and office equipments.
1999	The Aga Khan Foundation	Valuation of entire asset portfolio countrywide for insurance and book purposes
1999	Diani Reef Hotel	Valuation of entire hotel assets for sale purposes
1999	Leisure Lodge	Valuation of all company assets for book purposes worth Kshs.2 billion

LANGUAGES:

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Swahili	Good	Good	Good

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Staff Member or authorized official from the firm	Signature	Date
Ezekiel Oranga		10 October 2018

5.3 Dr. Beneah Manyuru Mutsotso: Sociologist/ Socioeconomist

Proposed Position:	**Sociologist/ Socioeconomist**		
Name of Firm:	Log Associates Ltd., Kenya		
Name of Staff:	Dr. Beneah M. Mutsotso		
Profession:	Sociologist		
Years with Firm:	Twenty (20)	**Nationality:**	Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Patron of Sociology Students Association
- Member of the Kenya Sociological Association

KEY QUALIFICATIONS

Dr. Mutsotso holds a Ph.D and an MA degree ***in Sociology and BA in Sociology*** both from University of Nairobi. He worked with Planning and Evaluation Research Consultants in 1996-1997 as a Research officer. He also worked as a Project Coordinator with African Centre for Technology Studies between 1994 and 1995. Currently he is a lecturer at the University of Nairobi teaching on Sociology. He is a member of the ***Kenya Sociological association and patron of Sociology Students Association.***

In **2011**, Mr. Mutsotso was the **Team Leader** in the **Evaluation of Programme Activities** under the Ministry of Agriculture for The **National Accelerated Agricultural Input Access Programme (NAAIAP**): The study was meant to provide information about verifiable indicators to **assess impact of the programme** interventions in line with the project goals, objectives and activities as contained in the logical framework. Specific tasks effected during the study included: collection, analysis and documentation of study information, comparison of the program with other voucher programs in eastern and southern Africa.

He has also worked on several resettlement projects including Detailed Resettlement Action Plan (RAP) for the 428 Km for Loyangalani- Suswa 400kV Transmission line and Detailed Resettlement Action Plan (RAP) for the 127 Km Lessos- Tororo 220 kV Transmission line. These projects were carried out on behalf of KETRACO.

He worked with World Vision Kenya doing final evaluation of the Kahawa Area Development Program, 2008. He was involved in the Evaluation of the Emergency Water and **Livelihood Support programme** in Somalia, 2007.

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EDUCATION:

Qualification	Institution	Year
PhD	University of Nairobi	2010
Master of Arts in Rural Sociology	University of Nairobi	1994
Bachelor of Arts in Sociology	University of Nairobi	1992

EMPLOYMENT RECORD:

Date	Employer	Position Held
1998- to date	Log Associates	Associate Expert
1997- to date	University of Nairobi	Lecturer of Sociology
1996 – 1997	Planning and Evaluation Research Consultants	Research Officer
1994 – 1995	African Centre for Technology Studies	Social Protection Specialist

KEY EXPERIENCE SUMMARY:

Name of assignment or project:	Environmental and Social Impact Assessment for the Proposed Sewer Extension Projects.
Year:	2016/2017
Location:	Nyeri
Client:	Nyeri Water & Sewerage Company Limited (NYEWASCO)
Main project features:	ESMP
Positions held:	Sociologist Lead
Activities performed:	The project was not limited to the following scope: Description of the baseline environmental conditions of the project area, Description of the proposed project, Detailing Provisions of the relevant laws and regulations, Identification and discussion of any adverse impacts to the environment anticipated from the proposed projects with various stakeholders, Identification of appropriate mitigation measures and Provision of an environmental and social management plan
Name of assignment or	Consultancy services to Carry out an Environmental and Social Impact Assessment (ESIA) and RAP of Maragua Water Supply

project:	Project.
Year:	2016/2017
Location:	Murang'a
Client:	Maragua Water & Sanitation Company (MUWASCO)
Main project features:	ESMP and RAP
Positions held:	Sociologist
Activities performed:	Description of the baseline environmental conditions of the project area, Description of the proposed project, Detailing Provisions of the relevant laws and regulations, Identification and discussion of any adverse impacts to the environment anticipated from the proposed projects with various stakeholders, Identification of appropriate mitigation measures and Provision of an environmental and social management plan
Name of assignment or project:	Environmental and Social Impact Assessment Project Report for the Proposed Silali – Rongai 400kV double circuit Transmission Line
Year:	2016
Location:	Rongai
Client:	Kenya Electricity Transmission Company Ltd. (KETRACO)
Main project features:	ESMP and community consultation
Positions held:	Sociologist
Activities performed:	Included Literature review; detailed and updated description of the project design and proposed implementation schedule, costs, as well as suitable alternative options; an in-depth analysis of the environmental and social baseline conditions; an outline of policy, legal and institutional framework governing the energy sector with specific focus on power transmission; an exhaustive stakeholder (public) consultation; establish details of significant environmental and social impacts associated with the construction, operation, decommissioning and post-decommissioning of the project; recommend appropriate mitigation measures for all adverse environmental and social impacts and develop an environmental management plan (ESMP) for all project phases giving actions, responsibilities, cost estimates, timeframes and monitor-able parameters
Name of assignment or project:	Environmental and Social Impact Assessment (ESIA) for the Proposed Kalimorok and Lokichar Power Stations and Associated Substations Project

Year:	2014
Location:	Turkana
Client:	Rural Electrification Authority (REA)
Main project features:	ESMP and social development and consultation
Positions held:	Sociologist
Activities performed:	Identification and assessment of potential environmental and socials impacts of the projects; all potential significant adverse environmental and social impacts of the projects and recommend measures for mitigation; verified compliance with the environmental regulations and industry standards; identified problems (non-conformity) and recommend measures to improve the existing management system, assessed compliance with Authority's corporate environmental policy requirements and prepared an environmental Impact assessment report compliant to the Environmental Management and Coordination Act (1999) and detailing findings and recommendations
Name of assignment or project:	Detailed Environmental and Social Impact Assessment for Garsen-Hola-Garissa-Wajir High Voltage Transmission Line
Year:	2013
Location:	Garsen-Hola-Garissa-Wajir
Client:	KETRACO
Positions held:	Sociologist
Activities performed:	Collection and presentation of baseline information on the environmental characteristics of the existing situation with emphasis to the downstream environment, detailed description of the proposed project baseline and/or environmental setting. Development of a legislative and regulatory framework, carry out public participation and consultations on the positive and negative impacts of the proposed project
Name of assignment or project:	Environmental and Social Management Audits for Isinya – Suswa 400kV transmission line and associated 200kV/66kV substations at Isinya, Kimuka and Athi River.
Year:	2013
Location:	Isinya, Suswa, Athi River
Client:	KETRACO
Positions held:	Sociologist
Activities performed:	Identification of likely social and environmental impacts of the project; Suggest suitable measures for mitigation of such impacts at the planning, design, implementation and decommissioning stages, to eliminate or reduce their adverse nature (if any); Propose Environmental Monitoring Program to ensure that the mitigation

	measures are implemented during the project execution and timely corrective actions are taken, where required and to propose the Institutional arrangements required to implement and monitor the ESMP
Name of assignment or project:	Consultancy Services to carry out a siting study to Identify Sites for the Disposal of Solid Waste in Kisumu
Year:	2013
Location:	Kisumu
Client:	City Council of Kisumu
Positions held:	Sociologist
Activities performed:	This is an **integrated urban development project** that aims at improving governance of the local authority and improving the living conditions of residents of the town.
Name of assignment or project:	Environmental and Social Safeguards of the Kenya Water and Sanitation Service Improvement Project (WaSSIP)
Year:	2013
Location:	Kenya
Client:	Kenya Water and Sanitation Service Improvement Project (WaSSIP)
Positions held:	Sociologist
Activities performed:	The broad objective of the study is to strengthen the capacity of CWSB and the WSPs to effectively carry out environmental and social management issues
Name of assignment or project:	Development of a National Disaster Risk Management Plan
Year:	2012
Location:	Kenya
Client:	Ministry of Special Programme
Positions held:	Sociologist
Activities performed:	The project aimed to undertake a comprehensive study that clearly identifies and spells out needs, priorities, and objectives policy statements culminating in a National Disaster Risk Management Strategic Plan.
Name of assignment or project:	Water and Sanitation Service Improvement Project (WaSSIP) Environmental Management and Safeguards
Year:	2012

Location:	Coast region
Client:	Coast Water Services Board Kenya
Positions held:	Sociologist
Activities performed:	The WaSSIP project aimed at supporting water sector reform efforts in Coast Water Services Board and other water boards by achieving increased access to reliable and sustainable water supply and sanitation services, improving the water and waste water services and institutional strengthening and capacity building of Water Service Providers (WSPs).
Name of assignment or project:	Review of strategic plan & business plan
Year:	2011
Location:	Eldret
Client:	Eldoret Water& Sanitation Company Ltd
Positions held:	Sociologist
Activities performed:	The overall objective of this assignment was to develop a Strategic Plan focus*ing* on the twin theme of improving water supply infrastructure and the enhancement of service delivery to the clientele.
Name of assignment or project:	Development of a Sustainability Strategy for the Regional Development Authorities (RDAs)
Year:	2010
Location:	Kenya
Client:	Ministry of Regional Development Authorities
Positions held:	Sociologist
Activities performed:	The assignment entailed assessing the RDAs' capacity for resource mobilization and entering into Public-Private-Partnership (PPP) arrangements; assessing the RDAs' income generating capacity; identifying possible cost saving measures; assessing RDAs' current investment policy and portfolio and assesses the RDAs' fixed and moveable income generating assets, management structures and making the necessary recommendations. Arising from the above prepare a sustainability strategy that can be adopted by the RDAs
Name of assignment or project:	Consultancy service for developing a strategic plan for transformation of KPLC Training School to support vision 2030 and beyond
Year:	2010
Location:	Nairobi
Client:	Kenya Power & Lighting Co. Ltd:

Positions held:	Sociologist
Activities performed:	The overall objective of this assignment was to develop a Strategic Plan to transform the KPLC Training School to support the Kenya Vision 2030 and beyond through repackaging the school in line with modern training, research and development trends to be able to effectively serve the Kenya Power and Lighting Company (KPLC) and maintain a niche in the growing energy sector.
Name of assignment or project:	Review Kenya Sugar Industry Strategic Plan 2004-2009
Year:	2009
Location:	Kenya
Client:	Kenya Sugar Board
Positions held:	Sociologist
Activities performed:	Preparation of a strategic plan to spearhead the sugar industry
Name of assignment or project:	Long Term Intervention Works in Kisii Town-survey, detailed design and development of tender documents
Year:	2010
Location:	Kisii Town
Client:	Lake Victoria South Water Services Board
Positions held:	Sociologist
Activities performed:	The main objective of this assignment was to assist in the design of water and sewerage/sanitation infrastructure including the proposition of the social economic components relating to the viable formation and operation of local groups to be involved in the furtherance of pro-poor objectives of the program.
Name of assignment or project:	Long Term Intervention Works in Bondo Town-survey, detailed design and development of tender documents
Year:	2010
Location:	Bondo Town
Client:	Lake Victoria South Water Services Board
Positions held:	Sociologist
Activities performed:	The main objective of this assignment was to assist in the design of **water and sanitation infrastructure** including the proposition of the social economic components relating to the viable formation and operation of local groups to be involved in the furtherance of pro-poor objectives of the program.

Name of assignment or project:	Baseline survey on water supply and sanitation coverage in the informal settlements in towns in Lake Victoria South Water Services Board
Year:	2009
Location:	Kisumu
Client:	Lake Victoria South Water Services
Positions held:	Sociologist
Activities performed:	The objective of the project was to establish the baseline situation on water and sanitation coverage in the informal settlements towns within the jurisdiction of the LVSWSB

Name of assignment or project:	Study on Incentive based performance management for CWSB, WSPs and Coast Bulk Water Supply Unit
Year:	2014/2015
Location:	Coast, Kenya
Client:	Coast Water Services Board
Positions held:	Sociologist
Activities performed:	**Train and support staff and management** of CWSB and WSPs to be able to **carry out internal appraisal** and review of staff performance. Support CWSB and the WSPs develop and implement tools for determining best performing employees for purposes of recognizing and rewarding them. Identify the key **performance indicators** for CWSB and the WSPs. Undertake a baseline survey and study of the current performance levels of CWSB and the WSPs in line with the guidelines set by WASREB and as per the existing license and service provision agreements. The Consultant will also propose the expected progressive targets for the Board and the respective WSPs for the next five (5) years period. **Prepare PC guidelines and frame works** for the WSPs and also advise CWSB on the use of effective incentive and penalty mechanisms that will stimulate good performance. The consultant should propose the incentives to be given to best performing staff and WSPs, and also the penalties to be meted against none performers.

LANGUAGES:

Language	**Speaking**	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Swahili	Good	Good	Good

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Ezekiel Oranga		10 October 2018
Staff Member or authorized official from the firm	**Signature**	**Date**

5.4 Mr. James Richard Otieno Opollo: Safety and Health Specialist (SHE)

Proposed Position:	**Safety and Health Specialist (SHE)**		
Name of Firm:	Log Associates Ltd., Kenya		
Name of Staff:	Mr. James Richard Otieno Opollo		
Profession:	Safety Health and Environment Expert		
Date of Birth	8 November 1955		
Years with Firm:	Twelve (12)	**Nationality:**	Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- National treasurer, Kenya Occupational Health and Safety Association
- Graduate Status, The institute of Fire Engineers (U K)
- Member, Institute of Risk Management (U K)

KEY QUALIFICATIONS

Mr. James Opolo has a **BSc. degree in Chemistry**, a post graduate certificate in occupational Health and Safety in Birmingham (UK) and a certificate in Risk management and Environmental Monitoring in Liods Institute of Risk Management (UK). He has done courses in **First Aid, Advance Fire Engineering and Public Health and Safety** among others. Mr. Opolo is registered by Director of Occupational Health and Safety Services to carry out training and audit in **Occupational health and Safety.** He is registered as a graduate member of Institute of Fire Engineer (UK) and Institute of Risk Management (UK).

Mr. Opolo was recently in charge of Rejuvenating **Environment Health and Safety Programs of Pyrethrum Board of Kenya.** He has handled many consultancy jobs related to Occupational Health and Safety for various companies as a Trainer. Due to his vast experience and expertise in different fields we have proposed him as the **Occupation Health and Safety Expert** for this assignment.

DETAILED TASKS ASSIGNED:

- Literature Review
- Guides on the all the required environmental data to be picked
- Analyse and compile the environmental data
- Development of an EMP
- Report on the environmental concern

EDUCATION:

University/College	Year	Qualification
University of Nairobi	1975-1979	BSc (Chemistry)
I.L.O Centre Turn (Italy)	1983	Diploma in Energy Management
Aston University Birmingham (UK)	1986-1987	Post Graduate Certificate in Occupation Health and Safety
Liods Institute of Risk Management (UK)		Risk Management

RELEVANT SHORT COURSES

Title	Institution	Year
Advanced Fire engineering course	Johannesburg, South Africa	1986
Risk Management and Environmental Monitoring	Basildon Essex England	1987
Practical Health and Safety course	East Kilbride Scotland	1987
Instructor Training Course	Letchworth England	1987
Non-Destructive testing	Paisley College Scotland	1987
First Aid course	England and Nairobi	1986, 1994, 2001
Energy Management Seminar	OAU HQ, Addis Ababa in Ethiopia	1986
FKE Seminar on General & Working Environment in Nairobi		1994 &1996
Computer Application Course	Inter Compuera College, Nairobi	1997
Risk and Security Management course	Labadi Beach Hotel in Accra, Ghana	1997
Numerous Short courses locally in Occupation Health, Safety and Environment Management	Local colleges	2000

EMPLOYMENT RECORD:

Organisation Employed	Position Held	Period	Assignments Undertaken
Pyrethrum Board of Kenya	Occupational, Health & Safety Manager	Feb 2004 to date	Rejuvenating EHS Programs and inculcating quality in the systems
Log Associates	Associate	2006 to date	Various Consultancy Assignments
M/S Kenya Pipeline Company Limited	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe,
M/S Central Glass Industries	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe

M/S Safety Surveyors Ltd.	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
M/S Mather and Platt	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
M/S Housing Finance Company of Kenya	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
M/S Ricket Benksher Ltd	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
M/S Tetra Pak(K) Ltd	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
M/S Kenya Breweries Ltd	Consultant	Sep 2002-Jan 2004	Risk Management Consultant with M/S Modern Intersafe
Kenya Breweries	Environment Health Safety Manager	Feb 2000-Aug 2002	Formulation, Health & Safety Policy Formulation and Implementation
Kenya Breweries	Safety Manager	Jan 1998-Jan 2000	Health & Safety Rules Formulation
Kenya Breweries	Fire and Safety officer	Jul 1995-Dec 1997	Formulation of Fire Policy
National Cereals and Produce Board)	Ass. Technical Manager (Fire, Safety & Env. Mgt)	Jan 1992-Jul 1995	Enforcing Safety rules
Ministry of Labour	Provincial Inspector of Factories	Jan 1988-Jan 1992	Inspection of Safety Rules Compliance

KEY EXPERIENCE SUMMARY:

Experience Summary

2014 **Coast Water Services Board; Occupational Health and Safety Expert** in the Environmental and Social Safeguards of the Kenya Water and Sanitation Service Improvement Project (WaSSIP). The objectives of the study included:

- Increasing access to reliable, affordable and sustainable water supply and sanitation services
- Improving the water and wastewater services

- Institutional strengthening and capacity building of water service providers, within the coverage areas of the three water services boards

2012 **Conservation of Lake Sare for Community Livelihood for Lake Basin Development Authority**. **Occupational Health and Safety Expert:** The objective of the study to carry out a survey within Lake Sare and its environs with the objective of developing specific proposals on how the Lake resources can be utilized to improve the livelihoods of the communities within the area. Log Associates undertook socio-economic survey including institutional framework for conservation management at the community at the community levels; an ecological survey to determine flora and fauna; fish stock assessment; assessment of off shore activities and environmental degradation. In addition we developed various concepts on income generating activities that can be adopted by the communities. The proposed projects were technically and financially modelled in order to gauge their viability.

2011 **World Vision Kenya: Hydrological survey and Environmental and social impact assessment for eight proposed borehole in IsioloOldonyiro IPA; Occupational Health and Safety Expert:**

The main objective of this assignment was to conduct a hydrological survey and a social impact assessment for eight proposed boreholes in Isiolo- Oldonyiro IPA. The scope of work for the assessment was to:

- Review existing legal and institutional policy framework
- Assess the relative importance of the impacts of alternative plans, design and sites.
- Study and outlines cost effective mitigation measures to minimize possible negative impacts
- Develop an Environmental Management Plan (EMP) to guide the community in decision making and implementing the project in an environmentally friendly manner and future auditing
- Facilitate the management control of environment practice
- Raise community awareness on the impact of the project on the environment

2011 **World Vision Kenya: Hydrological survey and Environmental and social impact assessment for eight proposed borehole in Bartabwa IPA; Occupational Health and Safety Expert:**

The main objective of this assignment was to conduct a hydrological survey and a social impact assessment for six proposed boreholes in Bartabwa IPA. The scope of work for the assessment was to:

- Review existing legal and institutional policy framework
- Assess the relative importance of the impacts of alternative plans, design and sites.
- Study and outlines cost effective mitigation measures to minimize possible negative

impacts

- Develop an Environmental Management Plan (EMP) to guide the community in decision making and implementing the project in an environmentally friendly manner and future auditing
- Facilitate the management control of environment practice
- Raise community awareness on the impact of the project on the environment

2011 **KETRACO; Occupational Health and Safety Expert:** Detailed Resettlement Action Plan (RAP) for the 428 Km for Loyangalani- Suswa 400Kv Transmission line. The objectives of the study included

- Carrying out a detailed survey on the actual number of people to be affected by the proposed line:
- Detailed description of: Valuation Methodologies, Type and nature of compensation, Preferred method of valuation and justification for choice of this method , Compensation framework including legal framework, country laws and regulation
- Carrying out a detailed valuation of the amount of land to be affected by the project.
- Carrying out a detailed survey on the structures to be affected by the proposed line. This will be realized through:
- Preparing an inventory of losses and a detailed Entitlement Matrix that will be used for compensation

2011 **KETRACO Detailed Resettlement Action Plan (RAP) for the 127 Km Lessos- Tororo 220 Kv Transmission line ; Occupational Health and Safety Expert:** Identification and assessment of the actual number of people affected by the line route, detailed valuation of land, structures and trees that are affected by the line route as part of the physical scope. The other scope entailed baseline socio economic data on the people affected, valuation of structures and total land affected, compensation mechanism, conflict redress mechanism and a comprehensive report detailing all these variables. The study conformed to the requirements of the World Bank operational policies on involuntary Resettlement OP 4.12 as well as relevant national laws and legislations.

2010 **Rural Electrification Authority (REA): Occupational Health and Safety Expert** Environmental and Social Impact Assessment and Resettlement Action Plans (RAP) for the proposed construction of an off-grid diesel power generating station in Faza Island, Lokori and Loukitang.

2009 **The Kenya Power and Lighting Company limited: Occupational Health and Safety Expert** Environmental and Social Impact Assessment and Resettlement Action Plans (RAP)

of the proposedOlkaria-Sotik, Kisii-Sondu, Kisii-Awendo 132kV Transmission Line (231km).

2008 **Occupational Health and Safety Expert** in theFinal Evaluation of the Kahawa Area Development Program for World Vision Kenya.

2008. **Occupational Health and Safety Expert** in the Mid-term Evaluation of the Riruta Area Development Program for World Vision Kenya.

2008 **Occupational Health and Safety Expert** in the Baseline survey of the Pala (West Karachuonyo ADP) Area Development Program for World Vision Kenya.

2007 **ADRA-Somalia; Occupational Health and Safety Expert:** Evaluation of the emergency water livelihood support programme. The evaluation covered provision of water, training, infrastructure construction and rehabilitation. Dr. Mutsotso was the team manager.

2007 **Occupational Health and Safety Expert** in the feasibility Study of the Nile Equatorial Lakes Subsidiary Action Plan (NELSAP for the Government of Kenya.

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Kiswahili	Excellent	Excellent	Excellent

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Mr. James Opollo		10 October 2018
Name of Expert	**Signature**	**Date**
Ezekiel Oranga		10 October 2018
Staff Member or authorized official from the firm	**Signature**	**Date**

5.5 Dr. Dulo Simon: Civil Engineer

Proposed Position: **Civil Engineer**
Name of Firm: Log Associates Ltd., Kenya
Name of Staff: Dr. Dulo Simon
Profession: Civil Engineer
Date of Birth 1957
Years with Firm: Fifteen (15) **Nationality:** Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Graduate Member of the Institution of Engineers of Kenya (IEK)
- Graduate Engineer, Engineer's Registration Board of Kenya (ERB)
- Corporate Member of the Kenya Society of Agricultural Engineers
- Member of Nile Basin Capacity Building Network on river Engineering
- Fellow of the Hydrological Society of Kenya
- Member of Nile- IWRMnet
- Member of NileNet (Nile Basin Initiative)

KEY QUALIFICATIONS

Dulo holds a **PhD. Civil Engineering,** a **Master of Science degree** in **Resources Engineering** from **Birmingham University** and **Bachelor of Science degree in Civil Engineering** from The **University of Nairobi.**

Dr. Dulo Simeon Otieno is a **hydrologist** with over **22 years' experience in Supervision and evaluation of Irrigation water and projects nationally *and in Rwanda***. Dr. Dulo has served as a Team Leader, Review Consultant, **Hydrologist**, Sanitary Engineer and a research consultant in various Consulting firms.

He is an international capacity building expert in **of Integrated Water Resource Management (IWRM).** He has handled **various feasibility studies** for **Water and Irrigation development projects** in Kenya and Rwanda. His clients have been Governments of these countries as well as other organizations.

He is a qualified **Hydrologist** with substantial experience both in the academic world as well as practice of engineering. Currently, he's a lecturer in Water Resources Engineering and **Hydrology** at the Department of Civil and Construction Engineering, University of Nairobi. Key areas of specialization include; integrated water resource management in ASAL areas, water resources system analysis, water pollution and solid waste management.

EDUCATION:

University/College	Year	Qualification
University of Nairobi	2010	Ph.D. Civil Engineering
Birmingham University	1987–1988	M.Sc. Water Resources Engineering
University of Nairobi	1980–1984	B.Sc. Civil Engineering

RELEVANT SHORT COURSES

Year	Institution	Qualification
2009	University of Nairobi United States Geological Survey, Kenya	Certificate in Computer aided Groundwater Modelling
2008	UNESCO – IHE and Hydraulic Research Institute, Egypt	Certificate in Computer aided Catchment Modelling
2007	Nile-IWRMnet Nairobi, Kenya	Certificate in the economic and financial instruments for Integrated Water Resource Management (IWRM)
2006	Nile-IWRMnet Nairobi, Kenya	Certificate in the role of Integrated Water Resource Management (IWRM) in Ecological Conservation
2006	Nile - IWRMnet Addis, Ethiopia	Certificate in Conflict Resolution and Negotiation Skills for IWRM
2005	UNESCO- chair in Water Resources, Sudan	Certificate in Integrated Water Resource Management (IWRM).

EMPLOYMENT RECORD:

Period	Employing organization
2003-Date	Associate, Log Associates
1990-2006	Lecturer, University of Nairobi (Department of Civil Engineering)
1989-1990	Housing Research and Tutorial Fellow, Development Unit, University of Nairobi
1984-1989	Lecturer, University of Nairobi (Building and Civil Engineering Department)

KEY EXPERIENCE SUMMARY:

2013/15 Coast Water Services Board Kenya: Water and Sanitation Service Improvement Project (WaSSIP) Environmental Management and Safeguards: The WaSSIP project aims at supporting water sector reform efforts in Coast Water Services Board and other water boards by achieving increased access to reliable and sustainable water supply and sanitation services, improving the water and waste water services and institutional strengthening and capacity building of Water Service Providers (WSPs).

2013/15 Water Services Trust Fund (WSTF): *Provision of Oversight Management of Medium-Term ASAL Programme (MTAP).* The Medium-Term ASAL Programme which focuses on 6 ASAL counties i.e. Lamu, Tana River, Isiolo, Marsabit, Wajir and Garissa. Dr. Dulo was a professional for the Mother Support Organizations (MSO) providing oversight management of the MTAP programme (WSTF's component).

2012: South Nyanza Sugar Company Limited: Assessment on the impact of Awendo Water Project on Sony Sugar Water Needs: The main objective of the study was to find out what impacts the upstream uptake of water by the Awendo Water Project would have on SONY. The study was to generate data to enable planning of future water usage. Log Associates conducted field visits, sought information from other stakeholders, including WRA. Scope of the works included;

- Carrying out an assessment of the impact of the on-going Awendo water Project by LVSWSB on Sony Sugar Nucleus Estate
- Determining the effects of sharing water resources during scarcity periods/seasons of factory operations
- Determining the negative impacts of the project and the activities carried out on the company's land on the entire Sony sugar Factory

2012 Coast Water Services Board Asset Inventorization and Valuation: The overall objective of the assignment was to carry out asset inventorization and valuation of (CWSB) assets for the purpose of accounting and updating the Board's asset register. Log Associates valued all movable and immovable assets for Coast Water Services Board in order to enable the Board identify all its physical assets, keep records in a proper and professional manner and ascertain their values. The valuation exercise was carried out across its six counties namely Mombasa, Kilifi, Kwale, Taita-Taveta, Lamu and Tana River. The assets included: Land, Buildings, Machinery and Equipment, Furniture and fittings and Water supply infrastructure.

2011 Eldoret Water & Sanitation Company Ltd; Review of strategic plan & business plan. The overall objective of this assignment was to develop a Strategic Plan focusing on the twin theme of improving water supply infrastructure and the enhancement of service

delivery to the clientele. The plan developed strategies that focused on enhanced infrastructural development and the promotion of efficiency in service delivery. In addition Log Associates developed a comprehensive business plan on behalf of the WSP to guide the WSPs business operation for the period 2012-2017. The focus of the business plan was ensuring financial stability of the company while at the same time rapidly expanding water supply infrastructure to match the growing population.

2011 **World Vision Kenya: Environmental Impact Assessment and Hydro-geological survey in Bartabwa IPA.** The objective of the assignment was to:

- Highlight environmental issues with a view to guide policy makers, stakeholders and government agencies to help them understand the implication of the EIA report and make the necessary decision
- Review existing legal and institution policy framework
- To assess the relative importance of the impacts of alternative plans designs and site
- To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle
- To study and outlines cost effective mitigation measures to minimize possible negative impacts.
- Thereof develop an environmental management plan to guide the community in decision making and implementing the project in an environmentally friendly manner and future auditing
- Facilitate the management control of environment practices
- Raise community awareness on the impact of the project on environment

2010 **Lake Victoria South Water Services Board Long Term Intervention Works in Kisii Town-survey, detailed design and development of tender documents:** The main objective of this assignment was to assist in the design of water and sewerage/sanitation infrastructure including the proposition of the social economic components relating to the viable formation and operation of local groups to be involved in the furtherance of pro-poor objectives of the program. The specific objectives of the project included:

- Description of the project area in terms of existing water and sewerage situations
- Assessment of water and sanitation demands of the project area with clear segments for appropriate interventions example informal settlements, peri urban population and core urban population
- Design for water and sewerage interventions
- Environmental Impact Assessment

2009 **Lake Victoria South Water Services Board:** Baseline survey on water supply and sanitation coverage in the informal settlements in towns in Lake Victoria South Water Services Board. The objective of the project was to establish the baseline situation on water

and sanitation coverage in the informal settlements towns within the jurisdiction of the LVSWSB. The specific objectives of the included:

- Establishing population living in each informal settlement within the listed towns.
- Provision of details on numbers of water kiosks and various types of sanitation facilities in each informal settlement
- Provision of preferred sanitation option in each informal settlement
- Establishing baseline situation on water supply and sanitation coverage in the informal settlements in the listed towns. in reference also to service levels for water coverage and sanitation coverage in accordance to Water Service Regulatory Board benchmarks and rank these in the ranges provided by the Regulator (i.e. good, acceptable and not acceptable for each informal settlement).
- Establishing additional number of people served in the informal settlements with safe water by the Board/ Water Service Providers since 2005/06 financial year
- Establishing the level of gender in the management of water kiosks in the informal settlements
- Provision of efforts in place to improve access to water and use of improved sanitation Connectivity to sewerage systems in the informal settlements by various players e.g. the Board, Water Service Providers, Local Authorities, NGOs etc.
- Developing capacity of the Board and contracted WSPs to establish and maintain a database of water and sanitation coverage in the informal settlements

2009 **Water Resource Expert; Ministry of Water and Irrigation, Kenya.** The main project feature was developing a National Flood Management Strategy.

2008 **Ministry of Water and Irrigation, Kenya; Team Leader.** The main project features were: Technical audit and valuation of assets in the northern region of the RVWSB and preparation of asset registers for new water utility companies.

2008 **Ministry of Water and Irrigation, Kenya; Review Consultant** The main Project features included Audit and evaluation of sector performance in the 2007/08 financial year and recommending undertakings for the next financial year 2008/09.

2007 **Date Heritage Consultants, Kenya; Water Engineer.** The main Project features were Supervision and Quality control of water and sanitation projects in Lake Victoria North on behalf of the Water Services Board on the following Rural Water and Sanitation Projects which include:

- Seum Project in TransNzoia East district in Rift Valley Province.
- Khalumuli Project in Yalusi, Bungoma district.
- Hydrological survey for the Ganzo Tea Estate water supply
- Design of:

- Intake works and transmission lines for the project in Rwanda.
- Water treatment and distribution network to Project factory, staff estates, schools and social amenities.
- Waste water collection and treatment units for the project

2005/06 Howard Humphreys (EA), Kenya; Sanitary Engineer Local counterpart for Masinga Dam Project. The main features included**:**

- Review of design criteria and data on Masinga Dam.
- Hydromet data acquisition and basic analysis for model application.
- Analysis of the existing records for flow during the operational life of the Masinga Dam.
- Development of a water budget analysis to co-analyse with the Q-H curves.
- Update and analyse the evaporation data after the last study.
- Evaluation and synthesis of the data needed for the sub catchments for running the rainfall-runoff model.

2006-15 Kenya Coordinator; Nile Basin Capacity Building Network Regional Research; (NBCBN-RE) Nairobi. The main duties include:

- Integrated Flood and Drought Management for Sustainable Development in the Nile Basin: (The case of Nzoia and Kagera River Basins.)
- Capacity Building for Local Communities To Effectively Respond To Floods And Droughts.

2003/06 Research Engineer Nile Basin Capacity Building Network; Nairobi. The main duties included:

- Hydrological forecasting and modeling for the Nzoia and Nyando Basins
- Collection of Hydrological and Meteorological data and run-off analysis for Nzoia and Nyando Rivers.

2002 –04 Research Consultant University of Nairobi

- Study of historical data from available meteorological and river gauging stations to determine trends in rainfall, river flows, and temperature variations for Nyando and Nile Basins.
- Hydrological appraisal of Nyando River Basin

1992 – 97 University of Nairobi, Department of Metrology; Hydrologist. World Metrological Organisation (IMTR) program on hydrology for capacity building in East and Central Africa

LANGUAGES:

	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Kiswahili	Excellent	Excellent	Excellent

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Dr. Dulo Simon 10 October 2018

Name of Expert	**Signature**	**Date**
Ezekiel Oranga		10 October 2018
Staff Member or authorized official from the firm	**Signature**	**Date**

5.6 Dr. Agnes W. Muthumbi: Ecologist

Proposed Position: **Ecologist**
Name of Firm: Log Associates Ltd., Kenya
Name of Staff: Dr. Agnes W. Muthumbi
Profession: Ecologist
Date of Birth 1965
Years with Firm: Eighteen (18) **Nationality:** Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Western Indian ocean Marine Scientists Association (WIOMSA)
- International Association of Meiobenthologists (IAM)

KEY QUALIFICATIONS

Dr Agnes W. Muthumbi has a **Ph. D Degree** in Biology and a **Master's Degree** in Nematology from Ghent University, Belgium, a **Master's degree** in Parasitology and a **Bsc. (Science)** from University of Nairobi.

She has undertaken research on the impacts of genetically *modified Bacillus thuringiensis (Bt)* corn on non-target soil nematodes, **Environmental Impact Assessment** project funded by US Environmental Protectorate Agency (EPA).

DETAILED TASKS ASSIGNED:

- Literature Review
- Identification of the endangered species with the proposed area
- Predicts the effect and proposed mitigation measures
- Reporting

EDUCATION:

University/College	Year	Qualification
Ghent University	1998	Ph. D (Biology)
Ghent University	1994	MSc. (Nematology)
University of Nairobi	1993	MSc. (Parasitology)
University of Nairobi	1989	BSc. (Science)

EMPLOYMENT RECORD:

Date	Position
2000 to date	Associate, Log Associates Ltd, Kenya
2006 to date	Senior Lecturer, University of Nairobi, School of biological Science
2003-2004	Post-doctorate Research Associate, Department of Earth, Ecological & Environmental Science, University of Toledo, USA
2000-2006	Lecturer, University of Nairobi, Department of Zoology
1999-2000	Post-doctorate Research Associate, Ghent University, Marine Biology section, Belgium
1989– 2000	Researcher, Kenya Marine and Fisheries Research Institute

KEY EXPERIENCE SUMMARY:

2014 **Ecologist/Biologist** for the Kenya Electricity Transmission Company (KETRACO) - **Environmental and Socio-Economic Impact Assessment (ESIA)** for Silali-Rongai High Voltage Transmission Line.

2013 **Ecologist, Environmental and Social Impact Assessment** of the Garsen-Hola-Garissa-Wajir High Voltage Transmission Line. The main objective of this assignment was to identify significant environmental and social impacts associated with the proposed project and recommend appropriate mitigation measures for integration in all phases of the projects cycle. Dr. Muthumbi undertook the tasks below:

- Describe the baseline environment; the environmental characteristics of the existing situation around each facility
- Address all the natural resources aspects of the assignment
- Reporting

2012 **Biologist, Food and Agricultural Organization (FAO); *Literature and Field Based Studies to Document and Test the Most Appropriate Methods for Post-Harvest Handling and Storage*.** The overall purpose of the study is to develop a set of best practices on post-harvest handling and storage for wide scale adoption and for the reduction of aflatoxin contamination. The study was undertaken through a two-stage approach:

- Generation of information on postharvest practices and handling among communities living in marginal agricultural areas of Makueni, Machakos and Mwingi through literature reviews and field investigations

- Deriving from (a) above, carry out experiment to determine which storage practices would be most desirable for use within the selected marginal agricultural areas

The study was intended to develop policy recommendations aimed at improving cereal grain handling across the country and in particular, within the ASALs areas.

2011 **Ecologist, Conservation of Lake Sare for Community Livelihood for Lake Basin Development Authority**. The objective of the study to carry out a survey within Lake Sare and its environs with the objective of developing specific proposals on how the Lake resources can be utilized to improve the livelihoods of the communities within the area. Dr. Muthumbi undertook an ecological survey to determine flora and fauna; fish stock assessment; assessment of off shore activities and environmental degradation. In addition she assisted in the development of various concepts on income generating activities that can be adopted by the communities. The proposed projects were technically and financially modeled in order to gauge their viability.

2011 **Ecologist, African Queen Gold Kenya. Environmental and Socio-Economic Impact Assessment (ESIA) for Core Drilling and Trenching at Odundu Area, Rangwe Division, Homabay District:** The investigations carried out by the experts examined the potential impacts of the project on the immediate surroundings throughout the drilling phase. Dr. Muthumbi's role involved the assessment of all aspects pertaining to the ecological and biological conditions at the site and its environs during drilling. The ESIA complied with the legal provisions of the Environmental Management and Coordination Act (EMCA), 1999 and the succeeding legal supplement Environmental Impact Assessment and Audit EIA/EA Regulations, 2003.

2007 **Ecologist, Updating the Environmental and Social Impact Assessment (ESIA), Preparing the Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) for the Proposed Mombasa-Nairobi 400KV Transmission Line.** The project involved Updating the ESIA, Identifying the gaps in the ESIA Project Report and updating the study to a full ESIA, Preparation of the RAP whose purpose is to ensure that the losses incurred by affected people are redressed such that the project affected persons (PAPs) share project benefits, are assisted to develop their social and economic potential in order to improve or restore their incomes and leaving standards to pre project levels and are not worse off than they would have been without the project and preparation of the ESMP whose purpose is to define and reach an agreement with project sponsors concerning the following: Mitigation and enhancement programs, Monitoring programs, Consultations, Complementary initiatives, Responsibilities and institutional arrangements, Estimated costs, Implementation schedules and reporting

Research Experience

- Current Research: Assessment of Mangrove ecosystem recovery following mangrove forest rehabilitation using benthic fauna.
- Post-doctorate Research: Impacts of genetically modified Bacillus thuringiensis (Bt) corn on non-target soil nematodes, **Environmental Impact Assessment** project funded by US Environmental Protectorate Agency (EPA).
- Post-doctorate Research: The importance of marine nematodes in coastal carbon exchange in the North East Atlantic, Ocean Margin Exchange (OMEX II-II) Project, funded European Union.
- PhD Research: Taxonomic Diversity of Marine Nematodes from the Kenyan Coast on the Western Indian Ocean (WIO).
- MSc Research: **Ecology** of Free-living marine nematodes from mangrove sediments in Gazi Bay, Kenya.

Selected Publications:

- Muthumbi Agnes and Ann Vanreusel (2006). Order: Araeolaimida in Fresh Water Nematodes: Ecology and Taxonomy (eds). Abebe et al. eds (CAB).
- Muthumbi AW., A Vanreusel, K Soetaert, G. Duineveld and M. Vincx (2004). Meiofauna along the continental slope off the Kenyan coast on the Western Indian Ocean (WIO) with emphasis on nematode assemblages. International Review Hydrobiologia 89: 188-205.
- Soetaert, K, Muthumbi, A. and C. Heip,. (2002). Size and shape of ocean margin nematodes: morphological diversity and depth-related patterns. Mar. Ecol. Progr. Ser. 242: 179-193.
- Flach E, Muthumbi A, Heip C (2002). Meiofauna and Macrofauna community in relation to sediment composition at the Iberian margin compared to the Goban Spur (NE Atlantic). Progr. Oceanogr 52: 433-457.
- Muthumbi A.WN. & M. Vincx (1999). Microlaimidae (Microlaimoidea: Nematoda) from the Indian Ocean: Description of nine new and known species. Hydrobiologia 397: 39-58.
- Muthumbi AW. & M. Vincx (1998). Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: difficulties in morphological identification of Actinonema Cobb, 1920 and Rhips Cobb, 1920. Hydrobiologia 364: 155-167.

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Kiswahili	Excellent	Excellent	Excellent
Kamba	Excellent	Excellent	Excellent

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Name of Expert	Signature	Date
Dr. Agnes W. Muthumbi		10 October 2018
Ezekiel Oranga		10 October 2018
Staff Member or authorized official from the firm	**Signature**	**Date**

5.7 Dr. Peter Omenda: Geothermal Energy Specialist

Proposed Position: **Geothermal Expert**
Name of Firm: Log Associates Ltd., Kenya
Name of Staff: Dr. Peter Omenda
Profession: Geologist
Date of Birth 19th November 1962
Years with Firm: Seven (7) **Nationality:** Kenyan

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Geological Society of Kenya,
- Geothermal Association of Kenya,
- International Geothermal Association

KEY QUALIFICATIONS

Dr. Omenda Peter is a professional geologist with **PhD degree** in geological science from university of Texas, MSc. degree in geology and undergraduate degree in geology from university of Nairobi. He has also a Post Graduate Diploma in Geothermal Technology from University of Auckland, New Zealand. He is a member of geothermal association of Kenya and international geothermal association. He has over fifteen years' experience as a consultant in geothermal exploration in Kenya and neighbouring countries such as Uganda, Rwanda, Tanzania and Zambia. He is also a geothermal modeller. Some of the work undertaken in exploring geothermal gas include: Kapisya Geothermal Project in Zambia, Karisimbi Geothermal Project in Rwanda, Olkaria Geothermal Project in Kenya and Menengai Geothermal Project.

EDUCATION:

Date	Institution	Qualification
1997	University of Texas AT EL PASO, USA	PhD in Geological Sciences
1989	University of Nairobi	Master of Science (Geology
1991	University of Auckland, New Zealand	Post Graduate Diploma in Geothermal Technology
1986	University of Nairobi	Bachelor of Science (Geology)
2011	Jomo Kenyatta University of Agriculture and Technology	Master's in Business Administration

EMPLOYMENT RECORD:

Organisation Employed	Position Held	Period	Assignments Undertaken
Log Associates	Associate Consultant	2011 to date	Various Consultancy Assignments
ZESCO	Consultant Team Leader and Geologist	2006	Kapisya Geothermal Project
EWSA	Consultant Geologist, Geothermal Modeller	2012	Karisimbi Geothermal Project
KPLC/Kenya Electricity Generating Company Limited (KenGen)	Borehole geologist/exploration geologist	1989-2009	Olkaria Geothermal Project
Geothermal Development Company Limited (GDC)	General Manager and head of research and development	2009-2015	Menengai Geothermal Project

KEY EXPERIENCE SUMMARY:

Date	2006
Location (Country/City)	Zambia
Company	ZESCO
Project Sponsor / Co-Financier	ZESCO
Project	Kapisya Geothermal Project
Position	Consultant Team Leader and Geologist
Description	Lead geologist, Kapisya and Chinyunyu geothermal projects. Consultancy culminated in the development of conceptual models of the systems and recommendations for their developments.
Date	2012
Location (Country/City)	Rwanda
Company	EWSA
Project Sponsor / Co-Financier	EWSA, BTC
Project	Karisimbi Geothermal Project
Position	Consultant Geologist, Geothermal Modeller
Description	Review of exploration and conceptual model

Date	1989-2009
Location (Country/City)	Kenya
Company	KPLC/Kenya Electricity Generating Company Limited (KenGen)
Project Sponsor / Co-Financier	KPLC/KenGen
Project	Olkaria Geothermal Project
Position	Borehole geologist/exploration geologist
Description	Geological logging of geothermal wells at Olkaria; advice on drilling and conceptual modelling of geothermal systems.

Date	2009-2015
Location (Country/City)	Kenya
Company	Geothermal Development Company Limited (GDC)
Project Sponsor / Co-Financier	GDC and Government of Kenya
Project	Menengai Geothermal Project
Position	General Manager and head of research and development
Description	Coordination of the exploration and development of the geothermal project; head of research and development activities geared to geothermal development.

Specific regional experience

Country	Total Man Months	Dates
Zambia	1.5	2006
Rwanda	2	2009, 2010, 2012
Uganda	0.5	2015
Tanzania	1	2017
Kenya	6	2017

Selected Publications

- Omenda, P. A., 1991. Mineralogy and Petrology of Surface rocks at Eburru Geothermal Field, Kenya. Geothermal Institute, Univ. of Auckland, New Zealand, Report: Geotherm 91-14, 56 pp.
- Omenda, P. A. and Karingithi, C. W., 1993. Hydrothermal model of the Eburru Geothermal Field, Kenya. Geoth. Res. Council. Publ., vol. 17, pp. 155-160.
- Omenda, P. A., Onacha, S. A., and Ambusso, W. J., 1993. Geological setting and characteristics of the high temperature geothermal systems in Kenya. New Zealand Geothermal Workshop Proceedings, vol. 15, pp. 161-167.

- Omenda, P. A., 1994. The geological structure and reservoir characteristics of the Olkaria West geothermal field, Kenya. Proceedings of the Stanford Geothermal Reservoir Engineering Workshop, vol. 19, pp.125-130.
- Omenda, P. A., 1997. The Geochemical Evolution of Quaternary Volcanism in the South-Central Portion of the southern Kenya rift. PhD Dissertation, University of Texas at El Paso, 218pp
- Omenda, P. A., (1998). The geology and structural controls of the Olkaria Geothermal Field, Kenya. Geothermics. Vol. 27 1-16.
- Omenda, P. A. (2000): The geological controls on the chemistry of ground waters around Lake Naivasha, Kenya. In proceedings of Saline-Alkaline Lakes in Eastern and Southern Africa Workshop. Sponsored by DAAD and UNESCO, p. 53-59
- Omenda, P. A. (2001). Geothermal Power Generation in Kenya. In Renewable Energy Technologies: Potential for Africa; Proceedings of the 21st Session of the Governing Council of UNEP/Second Global Ministerial Environment Forum. "Dialogue in the Field, Naivasha Kenya." 46-65.
- Minghua Ren, Omenda, P., Anthony E., White, J., Macdonald R., Bailey, D. (2006). Application of the QUILF thermobarometer to the peralkaline trachytes and pantellerites of the Eburru volcanic complex, East African Rift, Kenya. Lithos 91, pp.109-124
- Omenda, P. A., 2009. Assessment of clay deposits in Isinya and Amboseli areas of Kajiado District for their use as drilling mud. KenGen Internal Report. Pp. 24.
- Omenda, P. A., 2009. Geology and geothermal potential of the northern Kenya Rift. KenGen Internal Report. Pp. 47.
- White, J.C., Espejel-García, V.V., Anthony, E.Y., Omenda, P.A., 2012. Open System evolution of peralkaline trachyte and phonolite from the Suswa volcano, Kenya rift. Lithos 152 (2012) 84–104.

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Kiswahili	Excellent	Excellent	Excellent

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these bio data correctly describe myself, my qualifications and my experience.

Dr. Peter Omenda 10 October 2018

Name of Expert	Signature	Date
Ezekiel Oranga		10 October 2018
Staff Member or authorized official from the firm	**Signature**	**Date**

6.0 APPENDIXES

- EIA Practicing License 2018, Prof Lawrence Gumbe
- EIA Practicing License 2018, Log Associates
- Nema Registration Certificate, Log Associates
- EIK Certificate of Membership 2018**,** Log Associates

6.1 EIA Practicing License 2018, Prof Lawrence Gumbe

FORM 7 (r.15(2))

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

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

License No : NEMA/EIA/ERPL/7782

Application Reference No: NEMA/EIA/EL/10823

M/S **Prof Lawrence Gumbe**
(individual or firm) of address

P.O. Box 10677-00100, Nairobi.

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **0831**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/27/2018** Expiry Date: **12/31/2018**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

Conditions For Licensing

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with code of practice and Professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.

General Conditions

1. All Environment Experts certified and registered in the accordance with the .n of relevant Regulations, may establish professional associations to complement and implement the objectives of the Code of Practice.
2. An Expert shall act professionally, accurately, fairly and in an unbiased manner in undertaking his work.
3. The Director General, in consultation with relevant stakeholders, may from time to time issue guidelines for the proper conduct of registered Environmental Impact and Audit Experts.
4. Every Environmental Expert shall each year attend at least two relevant seminars organized by the authority for the purposes of improving the professional expertise of its members.
5. No Expert shall exploit the inexperience, lack of understanding, illiteracy or other lack of technical knowledge in environmental matters of a project proponent, owner or the public, for his personal gain.

Receiving Instructions

1. No Environmental Expert shall act for any project proponent unless he has received written instructions form such project proponent or his authorized agent.
2. An Environmental Expert shall not unreasonably delay the carrying out of instructions received from the project proponent of his authorized agent.
3. An Environmental Expert shall discharge his responsibilities to the project proponent with due diligence and integrity.
4. An Environment Expert may terminate a contract on carrying out an environmental impact assessment or audit as stipulated in section 8 of the Code of Practice and Professional Ethics of EIA/EA Experts.

Carrying out an EIA/EA

1. An Environmental Expert shall follow relevant regulations or guidelines and directives issued by the Authority.
2. As Environmental Expert shall take due care and diligence to collect the relevant data to address the significant environmental issues in the various stages of the assessment or audit process and fully acknowledge the source of any data that is not the result of his findings.
3. Environmental Expert shall consult widely with all the relevant agencies, stakeholders, interested parties and the general public on all the matters that likely to affect them.
4. An Environmental Impact Assessment or Audit Report shall be based on the Terms of Reference of the Assignment and shall include all the matters relevant to the findings of the study, all the relevant matters are required by statutory provisions, and must be guided by professional standards and judgments.

Responsibility of Lead Environmental Experts

1. (1) An Environmental Lead Expert shall be responsible for the documents prepared by him/her on behalf of the project proponent.
   (2) An Environmental Expert shall guide the proponent throughout the preparation of the environmental impact assessment and/or environmental audit, and/or during implementation of the Environmental Management Plan.
   (3) An Environmental Expert shall disclose to a client or employer any relationships of conflicting or competing interests that may influence his judgment prior to the carrying out of work.

Misconduct of Environmental Experts

1. An Environmental Expert who contrivances a provision of Code of Practice and Professional Ethics shall be deemed to have committed professional misconduct and shall be subject to disciplinary action by the Authority as appropriate and as stipulated in the Code of Practice and Professional Ethics of Environmental Experts.

Disciplinary Action

1. Where an Environmental Expert is found to have committed professional misconduct by the Environmental Experts' Advisory Committee/Authority shall be punished as stated under section 19 of the code of Practice and Professional Ethics.

Appeals

1. (1) An Expert aggrieved by the decision of the Authority may apply for the review of such decision in the High Court.
   (2) If an application for judicial review shall not have been fined at the expiry of 30 days from the date of the decision of the Authority, the director General may publicize the disciplinary action taken against the Expert.

6.2 EIA Practicing License 2018, Log Associates

FORM 7 (r.15(2))

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

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

License No : NEMA/EIA/ERPL/7784

Application Reference No: NEMA/EIA/EL/10825

M/S **LOG ASSOCIATES**
(individual or firm) of address

P.O. Box 10677-00100, Nairobi.

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Firm of Experts**
registration number **0203**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/27/2018**

Expiry Date: **12/31/2018**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

Conditions For Licensing

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with code of practice and Professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.

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1. All Environment Experts certified and registered in the accordance with the .n of relevant Regulations, may establish professional associations to complement and implement the objectives of the Code of Practice.
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3. An Environmental Expert shall discharge his responsibilities to the project proponent with due diligence and integrity.
4. An Environment Expert may terminate a contract on carrying out an environmental impact assessment or audit as stipulated in section 8 of the Code of Practice and Professional Ethics of EIA/EA Experts.

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1. An Environmental Expert shall follow relevant regulations or guidelines and directives issued by the Authority.
2. As Environmental Expert shall take due care and diligence to collect the relevant data to address the significant environmental issues in the various stages of the assessment or audit process and fully acknowledge the source of any data that is not the result of his findings.
3. Environmental Expert shall consult widely with all the relevant agencies, stakeholders, interested parties and the general public on all the matters that likely to affect them.
4. An Environmental Impact Assessment or Audit Report shall be based on the Terms of Reference of the Assignment and shall include all the matters relevant to the findings of the study, all the relevant matters are required by statutory provisions, and must be guided by professional standards and judgments.

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Appeals

1. (1) An Expert aggrieved by the decision of the Authority may apply for the review of such decision in the High Court.
   (2) If an application for judicial review shall not have been fined at the expiry of 30 days from the date of the decision of the Authority, the director General may publicize the disciplinary action taken against the Expert.

6.3 Nema Registration Certificate, Log Associates

FORM 5 (r. 14(4))

Application Reference No: 19
Registration No: 0203
FOR OFFICIAL USE

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT EXPERT

This is to certify Ms. LOG ASSOCIATES
of P. O. BOX 10677-00100, NAIROBI (Address)
has been registered as an Environmental Impact Assessment Expert in accordance with the provisions of the Environment Management and Coordination Act and is authorized to practice in the capacity of a Lead Expert/Associate Expert/Firm of Experts (Type). FIRM OF EXPERTS

Dated this 11TH day JUNE of 2004

Signature

(Seal)

Director General
The National Environmental Management Authority

GPK (L)

6.4 EIK Certificate of Membership 2018, Log Associates

Cert No. EIK/1/1424

EIK Environment
INSTITUTE OF KENYA

Certificate of Membership

This is to certify that

LOG ASSOCIATES

Is a Firm registered with Environment Institute of Kenya
An Institute Founded in the year 2014 to extend and disseminate
Environmental knowledge and promote the
practical application for public good.

Herbert Tawa Mwachire
Chairman

12/04/2018
Date

This Certificate remains the property of Environment Institute of Kenya. Membership is subject to annual renewal

MINUTES OF MENENGAI WEST GEOTHERMAL DRILLING PROJECT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDIES CONSULTANCY KICK OFF MEETING HELD ON WEDNESDAY 22/08/2018 AT POLO CENTRE BOARD ROOM

PRESENT

1. Gabriel Wetang'ula – GDC– Manager, Environment, Chair
2. Francis Opiyo – GDC – Scientist, Environment, Taking Minutes
3. Hockly Simboyi – GDC – Scientist, Environment
4. Noel Mbashu– GDC – Area accountant, Central Rift
5. Pascal Manan– GDC – Senior officer, Community Relations
6. Olivia Kimathi– GDC – Officer, Supply chain
7. Adelaide Simiyu– Log Associates Consultant/ Asst. Technical & Operation Officer
8. Lawrence Gumbe– Log Associates Consultant/– MD & CEO/Team leader
9. Ezekiel Oranga – Log Associates Consultant – Chief Technical & Operation Officer
10. James Odolo – Log Associates Consultant –HSE Expert

AGENDA

1. Introduction
2. Chairman's brief and matters arising.
3. AOB

No.	ITEM	DISCUSSION	ACTION BY
MWES/01/18	**Introduction**	❖ The meeting was opened by a word of prayer at 09:30 a.m. ❖ The chair summoned the meeting to order and asked members to do a round of introduction. ❖ The chair proceeded to give a background of the Menengai project and presented a map of the proposed Menengai West geothermal resource area.	Hockly Chair
MWES/02/18	**Chairman's brief and**	❖ The chairman indicated that Menengai West geothermal area may pose some social	

Chair: G. Wetang'ula Signature: _____ Date: 31/08/2018

Consultant: E. ORANGA Signature: _____ Date: 28/8/2018

Secretary: F. Opiyo Signature: _____ Date: 31/08/2018

	matters arising	challenges as it has more settlement than in the Menengai Caldera geothermal area. He further went on to point out that the consultants needed to exercise caution when dealing with these communities. He emphasized the need for the consultant to work with the Community Relations Department team from GDC.	Chair
		❖ The chair stated that the period of the consultancy should take at most 2 months from the date of the Kick-off meeting.	Chair
		❖ The chair shared the remuneration milestones with members and they were as follows: ➢ 10% Mobilization fee upon submission of acceptable Inception report, clear timelines from contract effective date and proof of field mobilization of proposed staff ➢ 40% upon submission of draft ESIA,ESMP,SEP and LACF reports ➢ 40% Upon submission of final ESIA,SEP and ESMP reports ➢ 10% upon submission of Final LACF report.	
		❖ The chair also stated that GDC expects that the consultants will make follow-up with all respective authorities to ensure that GDC get the prerequisite licenses.	
		❖ The Chair requested Log Associate to provide revised timeline indicating key deliverables based on the 2 months work duration as stipulated in the signed Contract document by both parties,	Log Associates
		❖ The Lead consultant/ Team Leader gave a brief background of their firm and previous works conducted. IIe offered apologies for	

Chair: G. Letangule Signature: [signature] Date: 31/08/2018

Consultant: E. OKANGA Signature: [signature] Date: 28/8/18

Secretary: F. Odiyo Signature: [signature] Date: 31/08/2018

		the other members of his team that were not able to attend the Kick off meeting. He assured the GDC team they will be present during the ESIA study. ❖ The consultant asked the Chair who will be GDC contact person. The Chair responded by saying he was contact person for and will be deputized by Francis Opiyo when the Chair is away. ❖ The Team leader indicated that their contact person will be Ezekiel Oranga (Chief Technical and Operation Officer) and will be deputized by Adelaide Simiyu. ❖ The chair went ahead to state that respective scientists from GDC will offer assistance where needed.	Log Associate Team Leader/ CEO
NFH/16/17	**AOB**	❖ The Chair noted that the project effective date had already commenced and there have been some delays. The sooner the studies start the better. ❖ The Log Associates' Chief Technical and Operation Officer requested that all relevant documents in Possession of GDC should be shared with them for effective planning. It was agreed that they will receive all the documentation by Friday 24th August ❖ The GDC team was looking forward to working with the Log Associates team successfully and meeting the other members of the consultancy team not present ❖ There being no other business the meeting was adjourned at 10:30 a.m.	Chair Francis Opiyo Pascal, Francis and Hockly

Chair: G. Wetangi Signature: _____ Date: 31/08/2018

Consultant: E. ORANGA Signature: _____ Date: 28/8/18

Secretary: F. Opiyo Signature: _____ Date: 31/08/2018

Kick-off Meeting

VENUE:	GDC Nakuru Regional Office	9:00 am	Date: 22/8/2018

No.	NAME	DESIGNATION	CONTACT	EMAIL
1.	Olivia Kimathi	Supply Chain Officer	0714746987	okimathi@gdc.co.ke
2.	HOCKINS SIMBOTI	SCIENTIST II, ENVT.	0724672827	hsimboti@gdc.co.ke
3.	Pascal Mavan	Senior officer, CR	0720754770	pmavan@gdc.co.ke.
4.	Noel Mbachu	Regional Accountant-Central Rift	0736 188803	nmbachu@gdc.co.ke
5.	Francis Oduyo	Environmental Scientist	0722944284	foduyo@gdc.co.ke.
6.	Gabriel Lwetangulo	Manager Environment	0723827359	glwetangulo@gdc.co.ke
7.	Lawrence Cumbe	Log Consultant	0725147754	
8.	Ezekiel Orang'o	Log Associates	0720758628	
9.	James Opolo	Log Associates.	0712-319514	
10.	Adelaide Simiyu	Log Associates	0723541229	

LOG Associates

Key Informant Interview List

No.	Name	Designation	Contacts	Signature
1.	ABDUL RAMADHAN	VALUER	0722760835	
2.	PF Beneah Mutsotso	Log Associates	0722833012	
3.	Ezekiel Orenge	Consultant	0720750628	
4.	Lawrence Gumbe	Consultant	0725147756	
5.	James Otolo	Safetec	0717-345514	
6.	CAROLINE EKWOM	GDC Sociologist	0729632992	
7.	FRANCIS OPIYO	GDC, Ecologist	0722941284	
8.	Paul Mukiri	Warden	0725 765 793	
9.	Simon WAMBUGU	TECH.	0726820744	
10.	AMOS KOTE	T. Manager	0720126836	
11.	ERIC OKOTH	TECHNICAL MANAGER	0721785247	
12.				
13.				

GEOTHERMAL DEVELOPMENT COMPANY LIMITED (GDC)

VOLUME III: STAKEHOLDER ENGAGEMENT PLAN (SEP)

February 2019

EXECUTIVE SUMMARY

This Draft Stakeholder Engagement Plan (SEP) has been prepared as part of the set of outputs under the Environmental and Social Impact Assessment (ESIA) for Menengai West geothermal drilling project commissioned by the Geothermal Development Company. The SEP is a key component of the project's Environmental and Social Management Plan (ESMP).

Effective stakeholder engagement helps build strong relationships with all stakeholders and local communities and reduces the potential project implementation delays through the timely identification of issues and grievances to be addressed. It also improves the environmental and social sustainability of projects, enhance project acceptance, and makes a significant contribution to successful project implementation. Stakeholder engagement activities for any Project should be done in compliance with national policies, laws and regulations as well as applicable international best practices, policies and guidelines prescribed by the Project's development partners.

The Stakeholder Engagement Plan has therefore been prepared in line with various international and national policies. Stakeholder engagement is aimed at achieving the following objectives:

i. Promote the development of respect and open relationships between stakeholders and Project proponent.
ii. Identify Project stakeholders and understand their interests, concerns and influence in relation to Project activities.
iii. Provide stakeholders with timely information about the Project, in ways that is appropriate to their interests and needs, taking into account factors such as location, language, culture, access to information, and also appropriate to the level of expected risk and adverse impact.
iv. Give stakeholders the opportunity, through consultation and other feedback mechanisms, to express their opinions and concerns about the Project development.
v. Support compliance with the Kenyan legislation for public consultation and disclosure for ESIA and alignment with financing standards of International Best Practice and guidelines for stakeholder engagement for ESIA.
vi. Provide a framework for linking PAPs with relevant institutions
vii. Record and resolve any grievances arising from Project-related activities.

This SEP identifies primary, secondary and tertiary stakeholders at the community, county, national and international levels and defines strategies for involving each of these categories of stakeholders into the project implementation process.

A key aspect of stakeholder engagement is the ability to receive and address stakeholder grievances in a timely manner. To achieve this, it is important for the project to design various platforms through which such grievances can be received, addressed and a feedback provided on a timely basis. The project will require to put in place an integrated system of telephone, verbal, postage, electronic (including social media, email, website login system, etc) all aimed at ensuring timely handling of any grievances. "Virtual stakeholders" on social media must be of specific interest through this system.

The report also looks at roles and mandates of various offices within GDC with respect to stakeholder engagements and attempts to highlight key resource areas for effective stakeholder engagements. Planning and budgeting for stakeholder participation if the project is a fundamental part of overall project planning and budgeting and must be considered an upfront project cost. It is our hope that this report will provide a basis for the project's stakeholder engagement strategy going forward and that each level of stakeholders will receive the necessary attention in accordance with their stake in the project.

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1 INTRODUCTION

1.1 Project Overview

Geothermal Development Company (GDC) is mandated with development of **5,000MW** of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospects across the Kenyan Rift i.e. Menengai, Olkaria, Suswa, Longonot, Eburru, Arus-Bogoria, Lake Baringo, Korosi, Paka, Lake Magadi, Badlands, Silali, Emuruangogolak, Namarunu and Barrier – Kenya (Figure 1-1 below). The Greater Menengai geothermal project is among the more than 14 high temperature geothermal areas within the Kenyan Rift being developed by GDC for geothermal energy utilization.

Figure 1-1: Geothermal fields in Kenya

1.2 Proposed Geothermal Drilling Project

GDC proposes to conduct a geothermal exploration drilling program (the Geothermal Drilling project) in Menengai West, Nakuru County. The proposed project involves drilling geothermal exploration wells to evaluate the viability of commercial geothermal energy-fuelled electric power generation. Log Associates Limited was contracted by Geothermal Development Company to carry out Environmental and Social Impact Assessment (ESIA) Study for the proposed project. The primary purpose of the ESIA

is to present a detailed analysis of the risks and impacts the proposed project would have on the existing environmental and social conditions in the proposed project area. Feasible mitigation measures are defined in the ESIA to avoid, minimize, or compensate for the impacts. The ESIA specifies the proposed mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the proposed mitigation measures.

This Stakeholder Engagement Plan has been prepared to meet the requirements specified in:

- The Terms of Reference (ToR) for the Environmental and Social Impact Assessment (ESIA) for the geothermal exploration project;
- World Bank's Guidance Note on Stakeholder Consultation in Investment Operations and; and
- International Finance Corporation (IFC) Performance Standards

1.3 Purpose of SEP

Effective stakeholder engagement helps build strong relationships with all stakeholders and local communities and reduces the potential project implementation delays through the timely identification of issues and grievances to be addressed. It also improves the environmental and social sustainability of projects, enhance project acceptance, and makes a significant contribution to successful project implementation. Stakeholder engagement activities for any Project should be done in compliance with Kenyan policies, laws and regulations as well as applicable international good case practice, policies and guidelines prescribed by the Project's development partners.

The Stakeholder Engagement Plan has therefore been prepared in line with various international and national policies. Stakeholder engagement is aimed at achieving the following objectives:

i. Promote the development of respect and open relationships between stakeholders and Project proponent.
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iv. Give stakeholders the opportunity, through consultation and other feedback mechanisms, to express their opinions and concerns about the Project development.
v. Support compliance with the Kenyan legislation for public consultation and disclosure for ESIA and alignment with financing standards of International Best Practice and guidelines for stakeholder engagement for ESIA.
vi. Provide a framework for linking PAPs with relevant institutions
vii. Record and resolve any grievances arising from Project-related activities.

The stakeholder engagement process is ongoing throughout the life of the project and includes formal scheduled consultations and meetings. Information will also be disseminated as needed to address

significant changes in schedule or other important project developments. The stakeholder engagement process includes two key aspects:

- Early and ongoing outreach to key stakeholders to provide information on the project
- A grievance redress process to address public complaints during implementation of the project

1.4 Scope of Application

The SEP applies to all activities and facilities that fall under the Geothermal Proponent's direct jurisdiction and control. Activities relating to other facilities are not covered in this SEP. This SEP focuses on engagement with external stakeholders. Involvement with internal stakeholders, including project staff, shareholders and contractors are not covered under this SEP.

1.5 Stakeholder Engagement Plan Outline

- Chapter One outlines purpose of the SEP, project overview and location
- Chapter Two reviews relevant international and national regulatory requirements on stakeholder engagement
- Chapter Three presents the identification of project stakeholders
- Chapter Four presents the Stakeholders analysis and engagement plan
- Chapter Five provides the details of the process for managing stakeholders' concerns and grievances and elaborates how the stakeholder engagement process will be recorded, monitored, evaluated and feedback mechanism given
- Chapter Six presents the responsibilities and resources required for Implementing the SEP
- Chapter Seven presents the Appendices which include a sample format of reporting grievances and a grievance closure form.

1.6 Project Location

The proposed project will be conducted in Nakuru County, Kenya. The area referred to as "Menengai West Geothermal Prospect" is located west of the Menengai caldera in the Kenya Rift valley. The Menengai geothermal area is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi, Kenya. The proposed project area is located along the Ol'Rongai Hills located on the western side of the Menengai Caldera. The major town centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo. (Figure 1-1)

The proposed Menengai west geothermal project falls on the western side of the Menengai caldera floor. The caldera floor, which is fairly flat, covers an area of about 88 km2 and is partially covered by young rugged lava flows. The Menengai west floor extends around Boita, Menengai Station, Ngata Farm and Kabarak Estate, the topography is made up of flat grounds whose relief is low. The prevalently flat area north of Menengai between Mogotio, Kampi ya Moto, Kisanana and the Bahati Escarpment is enlivened by north trending, double chain of Ol"Rongai volcanic centres by the roughly triangular, flat topped El Bonwala Hill and by arcuate chains of small hills that span from the Ol"Rongai

Estate to the Athinai Estate. East of the area is bound by the alignment of the Bahati Escarpment and the Marmanet rift cliffs bind the northeastern part.

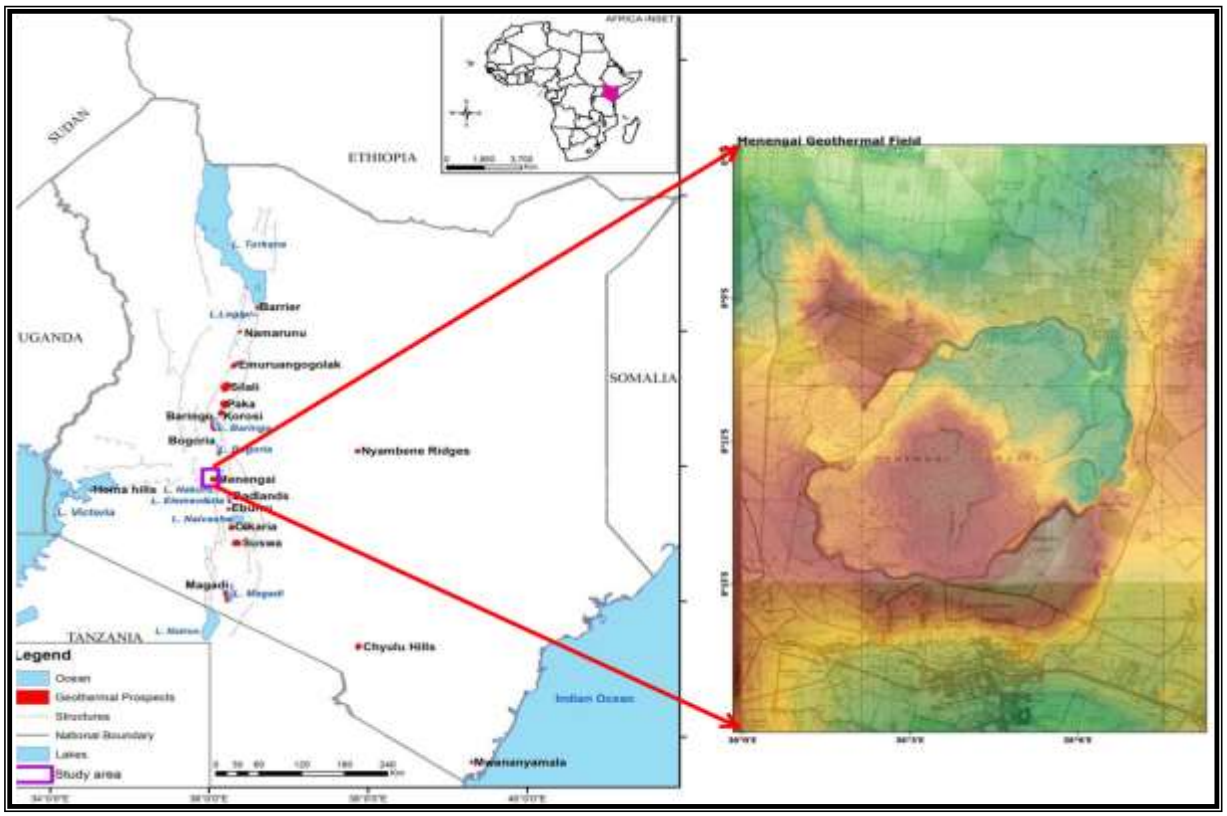

Figure 1-2: Map of Kenya showing the location of the Menengai geothermal exploration site

(Source GRC: Transactions, Vol. 36, 2012)

The following map (Figure 1-2) shows the specific proposed project locations.

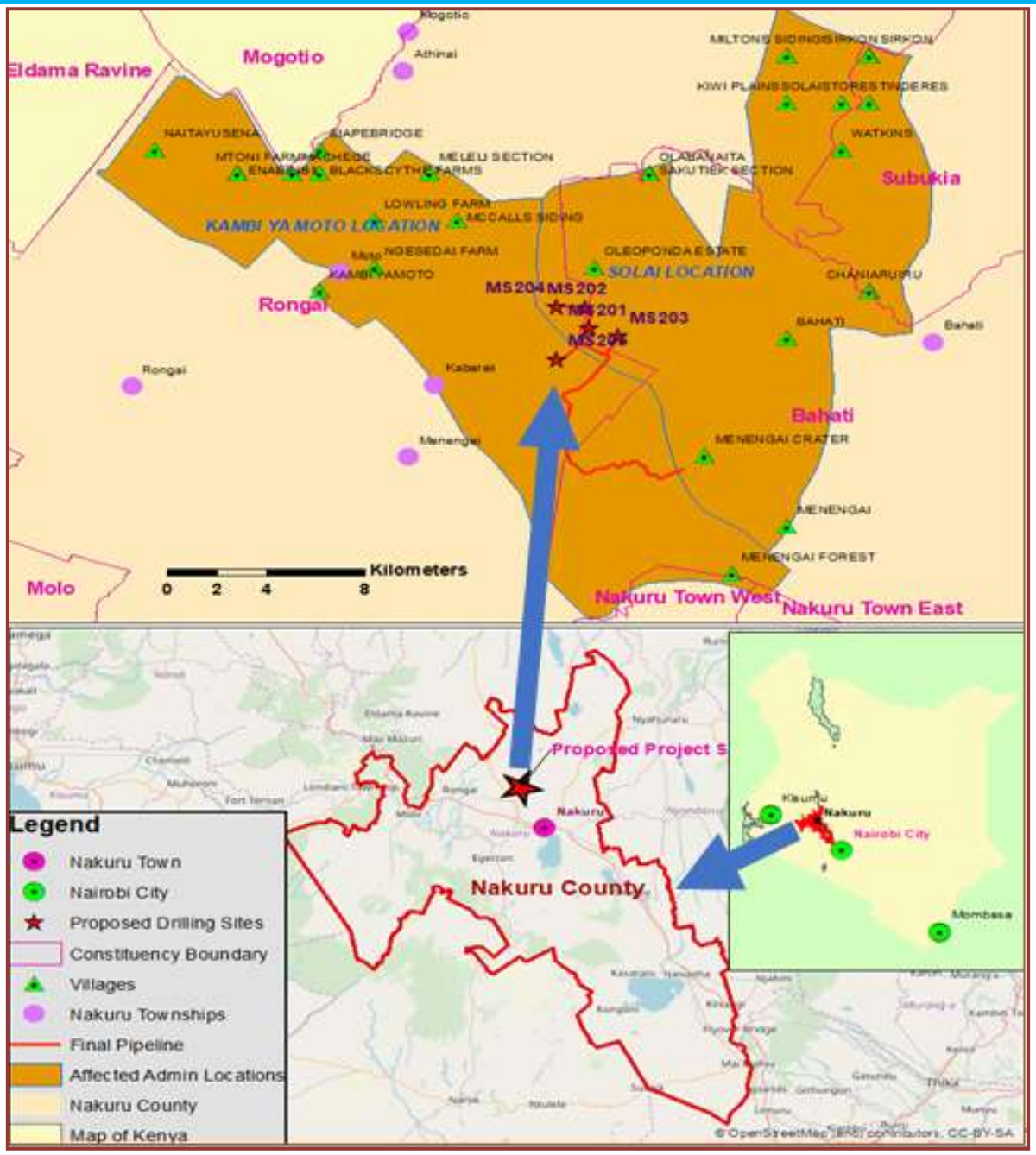

Figure 1-3: Map showing the proposed project location

1.6.1 Proposed Drilling Sites

The proposed project would involve geothermal exploration drilling in the five sites. The potential drilling areas shown on Figure 2-2 below include more land than would be needed during the geothermal exploration program. Larger areas were identified to provide flexibility for selecting suitable drilling sites.

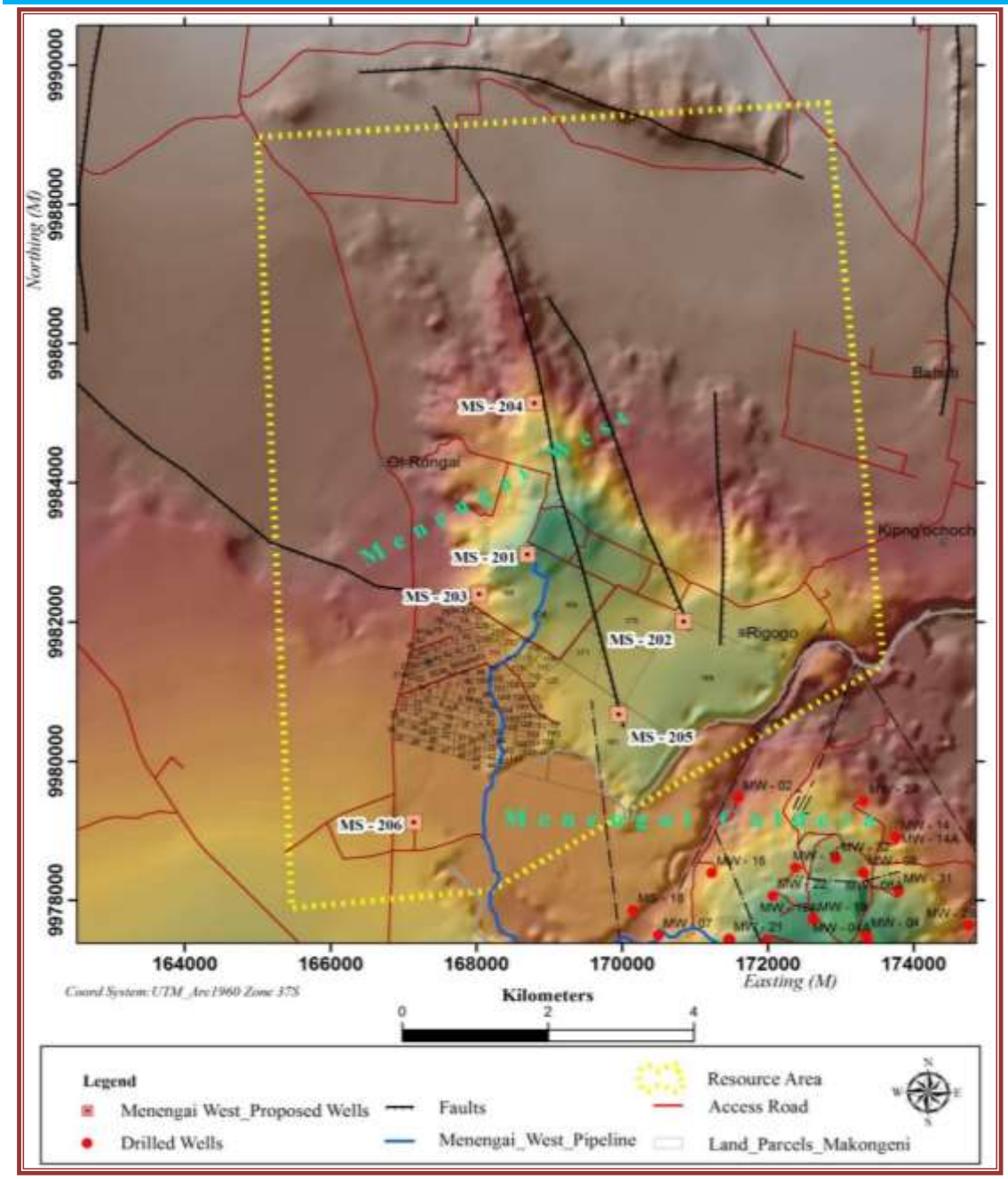

Figure 1-4: Potential drilling area, showing more land than would be needed

Table 1-1 below gives the coordinate locations of the specific five wells using the Coordinate System UTM Arc 1960 Zone 37s.

Table 1-1: Proposed Well Coordinates

S/No.	Name of Proposed Sites	Easting's	Northings	Relative Elevation
1	MS 201	169139	9983845	2042.05
2	MS 202	168984	9984832	1999.81
3	MS 203	170282	9983478	1958.32
4	MS 204	167806	9984870	1925.75
5	MS 205	167828	9982410	1956.34

1.7 Proposed Project Components

1.7.1 Drilling Process

Geothermal Exploration is normally a process conducted in phases. The drilling mechanism for the initial exploration phase consist of drilling exploratory wells in the resource target areas to evaluate sub-surface conditions and determine if there are indications of presence or absence of a commercially developable geothermal system.

The well drilling results is evaluated before determining the next drilling location and well design. If the exploratory drilling program indicates there may be a commercial resource, appraisal geothermal wells could be drilled in the potential area.

1.7.2 Site Development, Civil Works, and Supplies

Table 1-2 below provides key components/ activities that shall be carried out during the exploration exercise.

Table 1-2: Description of key proposed project components during the civil works

Key Project Components	Description
Equipment and Material Sources	Where applicable, equipment and materials will be sourced locally, if available. It is however expected that some equipment and materials would have to be shipped into the country, through either Port of Mombasa, or the Jomo Kenyatta International Airport, Nairobi, Kenya. Existing infrastructure at both Ports are adequate accommodate project needs and is the preferred method of obtaining large equipment and materials for the project. The equipment shall reach the site via the road infrastructure. Only sections of the all-weather roads leading to the proposed sites shall require rehabilitation to accommodate smooth transportation of the equipment and materials.
Access Roads	The equipment and materials would be transported from the ports to the exploration target areas using a network of existing paved and unpaved roads, as well as new access roads within the drilling target areas. Existing roads may also be improved by increasing the width at certain sections to accommodate the turning radius for vehicles and drilling equipment, and by reinforcing unpaved roads leading to the drilling target areas. Access roads would be improved or constructed as needed by removing trees and vegetation, grading, installing fill dirt, and/or installing gravel. If necessary, retaining walls along access roads would be installed or replaced consistent with engineering requirements. Fill material and gravel used for access roads would be purchased from local suppliers. The anticipated volume of fill material and gravel is expected to be minor, given that the well pad locations would be chosen at sites close to existing roads. Access roads would be established with a width of approximately 4 to 6 meters (which is already provided in the existing roads and wayleaves). Improvement (and where necessary, construction of new access roads) would occur immediately before well pad development. A drilling rig capable of completing the slim-hole wells is approximately 3 meters (about 10 feet) wide.

	Existing bridges and culverts would be reinforced or replaced, where necessary. Temporary or permanent drainage crossings would be installed as needed to accommodate equipment access. These crossing could include bridges, culverts, steel plates, and rock. Temporary crossing materials would be removed from drainage crossings following construction.
Equipment and Material Storage	Equipment and material storage sites would be developed near each drill pad or as close as possible if space is limited. The total space needed at each location would be approximately 0.1 to 0.2 hectare (0.25 to 0.5 acre). If necessary, storage sites would be cleared of vegetation and graded prior to use. Gravel and drainage materials may also be installed to facilitate all weather access. Equipment and materials at the storage sites would be transported to and from well pads and other project sites, as needed. If necessary, a security fence and lighting would be installed around the storage sites, and security guards may be stationed at the sites.
Workers Camp	If required, a worker camp would be established in the project areas to house the construction workforce during exploration activities in each area. Typically, the worker camp could house up to 50 workers and could include separate sleeping and bathing facilities for men and women, safe food and drinking water, air conditioning, first aid and medical facility, water storage, generators for electricity, and access to communication networks. If necessary, a security fence and lighting would be installed around the worker camp, and security guards may be stationed at the camp.
Well Pads	Well pads would be developed at each drilling location where the drilling equipment and materials would be positioned. A well pad for a exploratory wells are generally 100 by 100 meters or approximately 0.8 to 1.6 hectares (2 to 4 acres) in size. Well pads generally include the equipment and components listed below. The characteristics of full-sized large diameter wells are described further in Section 2.4.3 • Drill rig • Well head • Blowout prevention equipment • Power supply engines • Fuel tanks • Accumulator • Pipe racks • Drilling mud tanks • Drilling mud pumps • Water storage tanks • Water supply pipelines • Mixing tanks • Reserve pit • Office space • Storage space • Fire-fighting equipment • Parking space Well pad development would include removing vegetation (including trees). The ground surface would be prepared by grading, compacting soil, and installing a layer of gravel. Gravel used for the well pads would be purchased from local suppliers (which include several quarries within the project area). The typical layouts of a full- sized large diameter well is shown Figure 1-6 and Figure 1-5, respectively.

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Source: (Maurer Engineering Inc. 1998)

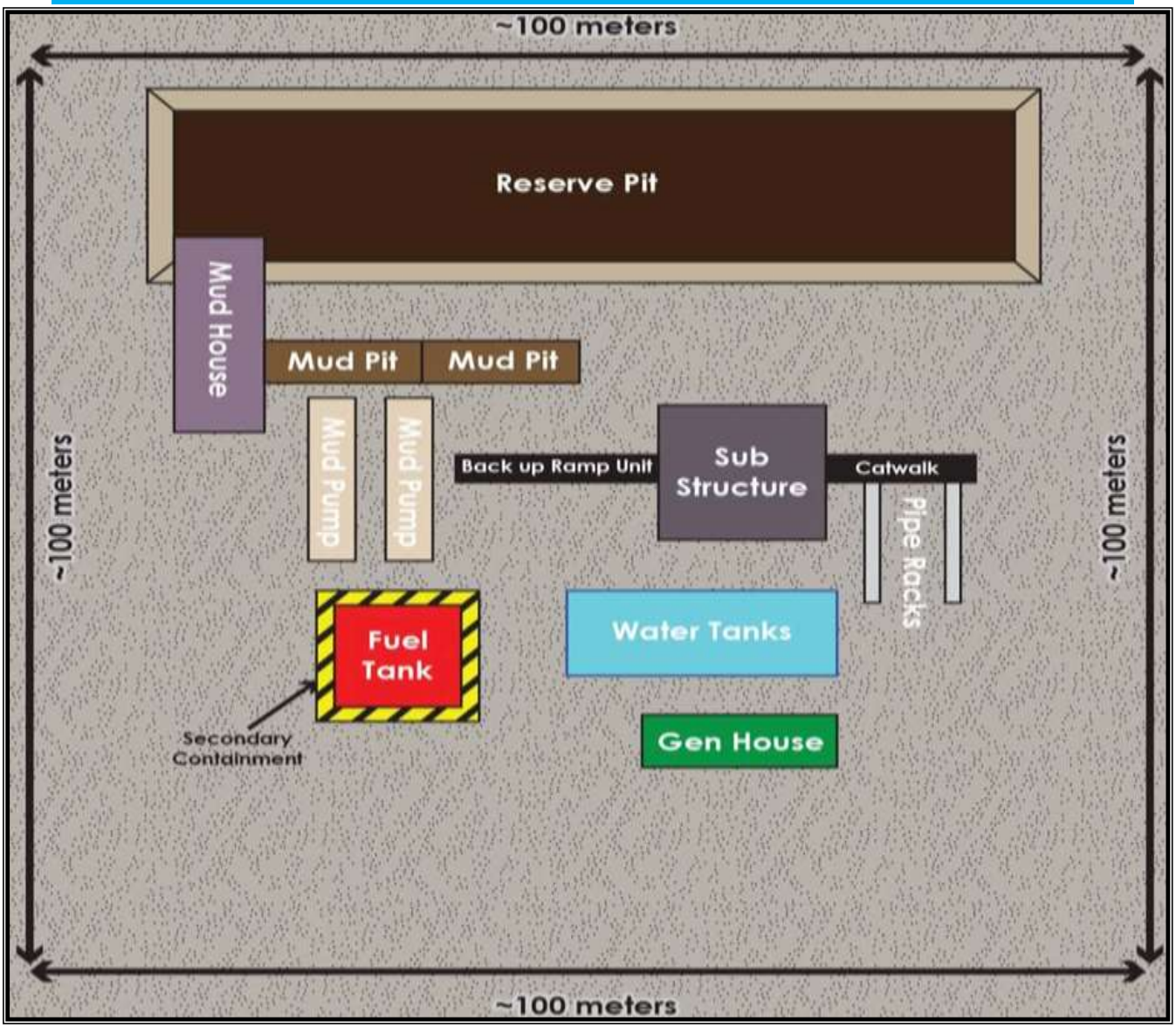

Figure 1-5:Typical Layout of a Full-Sized Large Diameter Well Pad (NOT TO SCALE)

Source: (Maurer Engineering Inc. 1998)

1.7.3 Well Drilling

As already described in the earlier sections, the proposed project includes drilling exploratory and appraisal wells at the potential drilling areas., The table below lists some of the key parameters of full-sized large diameter wells. (Fig 1-5)

Table 1-3: Potential Drilling Operations for Large Diameter Wells

Component	Full-sized Large Diameter Wells
Well Pad Dimensions	100 x 100 meters (0.2 hectare) (330 x 330 feet; 0.5 acre)
Drill Rig Dimensions	20 x 10 meters (66 to 33 feet)
Minimum Access Road Width	6 to 7 meters (18 to 24 feet)
Well Diameter at Depth	7 inches
Target Depth	Varies, but could be estimated at between 2,000 to 3,000 meters (6,600 to 9,850 feet)
Estimated Water Demand during Drilling	Estimated at 20 to 30 liters per second (up to 90 days)
Drilling Materials	• Drilling mud/fluid

	• Casing • Cement
Drill Cuttings/Waste Storage	Lined sumps
Drilling Period	30 to 90 days (up to 24 hours per day)
Geothermal Resource Testing	Injectivity and production testing
Testing Period	Typically 30 to 90 days (if working up to 24 hours per day)

Sources: (GeothermEx and Power Engineers 2017)

1.7.4 Geothermal Resource Testing

Testing for the presence or absence of an exploitable geothermal reservoir will be conducted after each well is completed. Depending on the final depth and characteristics of each well, these tests would include downhole temperature measurements, injection testing or production testing. Temperature-gradient measurements will be completed periodically for weeks after completion, after the drilling rig is off the location.

Wells that encounter elevated temperature and permeability at depth may be completed with a slotted liner.. If large diameter exploration wells are drilled and successfully encounter the geothermal reservoir, well and reservoir testing would be conducted to analyze characteristics of the resource. One or more initial short-term flow tests would occur at each exploration well, and one or more long- term flow tests will occur after the completion of all wells to assess the productivity of the geothermal reservoir and to sample the geothermal fluid.

1.7.5 Well Abandonment and Site Reclamation

The commercial potential of each exploration well would be assessed after testing. The well will not be abandoned if it is determined to have long-term use as a production well, monitoring well, or injection well. Equipment would be removed and the site cleared of excess material. The wellhead will remain in place for future testing, monitoring, or production. If a well is not determined to have commercial potential, monitoring of the well may continue or the well may be abandoned. Well abandonment typically involves plugging the well bore with enough cement to ensure that fluid in the reservoir would not flow into different aquifers; the casing would remain in place. Any wellhead equipment would be removed from the well, and a metal cap would be welded to the casing. The well pad sites would then be graded as necessary to restore the sites to the approximate original topography.

1.8 Water Demand and the Water Supply Line

The proposed project would require fresh water for the workforce and to support well pad compaction and well drilling. Potable water would be obtained, hence the project has a proposed key pipelines to deliver the water to all the proposed project sites as shown in figure 1.6

- Water pipeline routes from the water boreholes to the resource area within the proposed Menengai west geothermal project site shall be demarcated and vegetation cover cleared. However, in so doing, the report has recommended minimal vegetation destruction. The Report has also encouraged maximum use of road reserves (public lands) to minimise resettlement of people.
- Water pipelines shall be delivered to the site and laid from the water boreholes to the resource area within the Menengai west geothermal project site

Figure 1-6 below shows the project layout and the proposed routes for the water pipelines to each of the proposed project site.

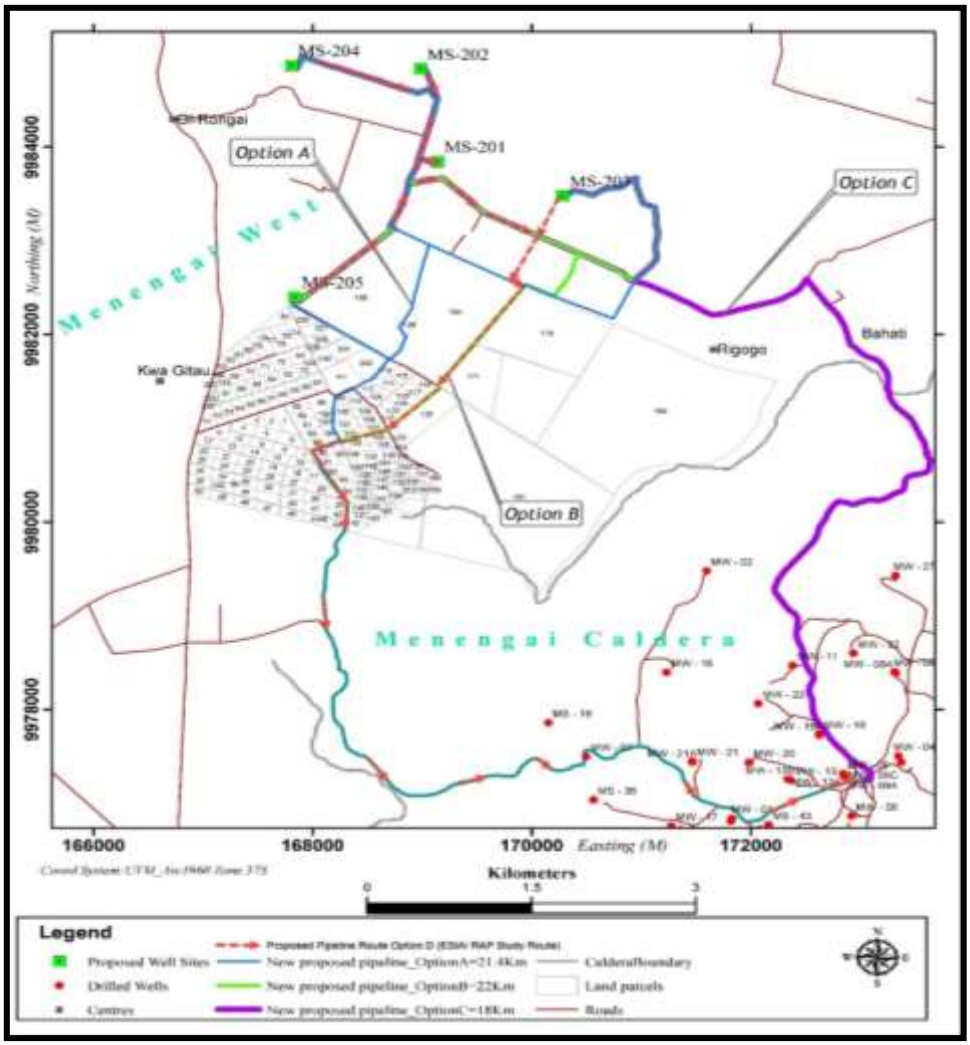

Figure 1-6:Project layout showing the proposed water supply routes to each of the proposed well site

1.9 Land Requirement for the Proposed Project

Based on **Error! Reference source not found.** of Large diameter wells) and ***Figure 1-6****:Project layout showing the proposed water supply routes to each of the proposed well site*) above, and also based on the discussions and consultations with the GDC field team during fieldwork study, the amount of land that would be required for the proposed well drilling project and the pipeline way-leave has been determined.

For each of the proposed geothermal exploration site, a total area measuring 140m by 120m (i.e. equivalent to16,800 sq.m, or 4.15 acre-US, or 1.68Ha) was proposed. For the purpose of the study, the

proposed well drilling site was taken as central. For the proposed water pipeline that would deliver water to the proposed project sites, 9-metre way-leave (which already exists as roads reserves) was proposed. Most section of the wayleave are available through the public road networks in the area, and therefore minimal private lands would be affected. All private lands likely to be affected by the proposed project have been discussed in the *Land Acquisition and Compensation Program Report (LACP) Report*, annexed to this Report.

1.10 Erosion and Sediment Management

Best management practices (BMPs) for erosion and sediment control would be developed during the project design. BMPs would be used to stabilize loose soil and control sediment. Typical BMP materials installed on construction sites include fibre matting, hydro-seed, and mulch, straw wattles, silt fencing, rock bags, and hay bales. Typical BMP procedures implemented on construction sites include wetting loose, dry soil during ground disturbance; preventing soil track-out onto paved roadways; and covering truckloads when transporting soil.

1.11 Hazardous Material Management

Hazardous materials, such as fuels, oils, and lubricants for construction equipment, would be stored in the designated storage area. Used oil would be gathered and stored in tanks at the storage area until it could be transported off site and disposed of at a facility that can accept hazardous materials. A roof would be installed over a portion of the storage area to protect construction materials from the rain. Wells would be drilled with water and non-toxic drilling mud. Hazardous materials would be transported, handled, and stored in accordance with applicable Kenyan laws, World Bank General EHS Guidelines Section 1.5 (2007a), and World Bank EHS Guidelines for Geothermal Power Generation Section 1.1 (2007b).

1.12 Waste and Effluent Disposal

All drill cuttings and drilling fluid would be discharged to the reserve pit or tanks. Drill cuttings would be left in the reserve pit. Fluids and solids would be tested to determine the chemical composition and identify any materials that may be hazardous. Any drill cuttings that exceed the toxicity threshold for hazardous waste would be treated as hazardous waste and disposed of off-site.

Latrines for workers would be constructed on the proposed project site and would be maintained in a clean condition. A septic tank system would be installed to manage the wastewater from the worker camp.

Trash would be maintained in covered receptacles at the well pads, storage area, and worker camp. Non-hazardous waste would be disposed of at an authorized dumpsites.

2 NATIONAL AND INTERNATIONAL REGULATORY REQUIREMENTS

2.1 Overview

Public consultations and participation in a development project is anchored in national laws. This SEP is designed to meet law requirements on stakeholder engagement to meet performance standards on environment and social sustainability. Public consultation is a mandatory part of the project development as outlined in the Constitution as well as international requirements such a world Bank and IFC Performance standards.

Stakeholder engagement must adhere to national requirements, as specified by the Environmental Management and Coordination Act, 1999 (EMCA, 1999) and related regulations which advocate for access to information, public participation in decision-making, and public access to justice in relation to the environment.

It is also important to mention that donors have policies, standards and guideline that strictly uphold the spirit of stakeholder engagement and public participation in development project. This chapter looks at the general legal, policy and administrative frameworks that emphasize consultations and stakeholder participation, both at national and international levels.

2.2 National Environmental Policy, 2012

The National Environmental Policy sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources, and recognises that natural systems are under intense pressure from human activities particularly for critical ecosystems including forests, grasslands and arid and semi-arid lands. The objectives of the Policy include developing an *integrated approach* to environmental management, strengthening the legal and institutional framework for effective coordination and promoting environmental management tools.

The policy seeks to ensure empowerment and participation of the people and their organizations at all levels in environmental management activities. One of the guiding principles of the policy is to promote equality among women and men who are key actors in natural resource use and management, and empower them to be totally involved in policy, programme and project design, decision making and implementation.

This policy therefore promotes meaningful consultation with stakeholders.

2.3 Environmental Management and Coordination Act (EMCA), 1999

The Environmental Management and Coordination Act, 1999 (EMCA, 1999) provides the legal and institutional framework for the management of the environment and related matters in Kenya. These

regulations shed light on detailed procedures required to do Environmental Impact Assessment (EIA) and Environmental Audit (EA) under sections 58 to 69 of the Act. Regulation 4 provides that no proponent shall implement a project that is likely to have any negative environmental impacts and for which an environmental impact assessment is required under the act or these Regulations. As such, all geothermal energy projects require environmental and social impact assessment and public participation is mandatory when conducting an ESIA. This regulation therefore emphasizes that people have the right to full consultation and to the expression of views in the planning and implementation of environmental policies and projects that affect them directly.

2.4 The Constitution of Kenya, 2010

The Kenya Constitution which is the supreme law of Kenya establishes the structure of the Kenyan government, and also defines the relationship between the government and the citizens of Kenya.

As the major binding document for all other derivative national laws and regulations, the Constitution of Kenya has several provisions, which are relevant to consultation and participation. The right of the public and the community to full consultations and participation is enshrined in the following articles; 35.6, 43.2 and 92.3 of the constitution.

- Article 69 (1) (d) encourage public participation in the management, protection and conservation of the environment;
- Article 232 (1) (d) of the Constitution states that, there must be involvement of the people in the process of policy making;
- Article 36 (1) states that, nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.
- Article 57 (a). States that the State shall take measures to ensure the rights of older persons (a) to fully participate in the affairs of society;91(1)(e) that the rights of all persons to participate in the political process, including minorities and marginalized groups should be respected

2.5 Kenya Vision 2030

The Vision promotes public participation in governance between amongst government, civil societies, private sector and citizens through free flow of information on various aspects. The Vision also advocates for the following strategies to strengthen public transparency and accountability:

- Encouraging public access to information and data
- Introducing civilian oversight around the key legal justice security institutions
- Strengthening parliaments legislative oversight capacity
- Community involvement in ensuring improved safety and security

2.6 AFDB Policy on Participation and Consultation

The Bank recognizes participation as an essential tool for the achievement of its objectives which include; poverty reduction and sustainable development. Participatory approaches have been shown to enhance project quality, ownership and sustainability.

Integrated Safeguards System (ISS) stipulates that a meaningful consultation and participation in the context of safeguards is vital. ISS sets out clear requirements for greater public consultation among and participation by communities and local stakeholders that are likely to be affected by the Bank's operations. It further requires that the consultation must meet the requirements of being obtain access to information and to be informed prior about the project and of achieving broad community support, especially in high-risk projects or projects affecting vulnerable groups.
ISS makes it clear on how consultations should be integrated into specific steps in the assessment process, such as developing draft terms of reference for ESIA, draft ESIA, and draft Environmental and Social Management Plans (ESMP) for Category 1 projects.

2.7 Rio Declaration

Kenya is a signatory of the Rio Declaration on Environment and Development (1991). Principle 10 of the Declaration states that; "Each individual shall have an opportunity to participate in the decision-making processes, facilitated by the widespread availability of information".

2.8 World Bank Standards

Since the WB is a potential lender for the Project, the project must align with good international practice, including the ESS-10 (Information Disclosure and Stakeholder Engagement) in its Environmental and Social Framework 2016. The specific objective of ESS-10 requires that;

For all projects, Project Company will consult with stakeholders to identify issues and concerns in order to inform the environmental and social assessment and the design and implementation of the project. Disclosure of relevant project information helps stakeholders understand the risks, impacts and opportunities of the project. If communities may be affected by environmental or social impacts from the project, the Borrower will provide them with access to the following information:

a) *The purpose, nature and scale of the project;*
b) *The duration of proposed project activities;*
c) *Any risks to and potential impacts on communities and proposed mitigation plans;*
d) *The envisaged stakeholder engagement process, if any, and opportunities and ways in which stakeholders can participate;*
e) *The time and venue of any envisaged public consultation meetings, and the process by which meetings are notified, summarized, and reported; and*
f) *The process and means by which grievances are raised and managed.*

The information will be disclosed in local language(s) and in a manner that is accessible and culturally appropriate, taking into account any specific needs of groups that may be differentially or disproportionately affected by the project because of their status or groups of the population with specific information needs (such as, literacy, gender, differences in language or accessibility of technical information).

3 STAKEHOLDER IDENTIFICATION AND MAPPING

3.1 Introduction

IFC's Performance Standard 1 defines stakeholders as: "...persons, groups or communities external to the core operations of a project who may be affected by the project or have interest in it. This may include individuals, businesses, communities, local government authorities, local nongovernmental and other institutions, and other interested or affected parties".

The objective of stakeholder identification is to establish which organizations and individuals may be directly or indirectly affected (both positively and negatively), or have interests in the Project. Stakeholder identification is an on-going process, requiring regular review and updates. Stakeholder engagement is therefore, a basis for building strong, constructive and responsive relationship that are essential for successful management of a project.

3.2 Stakeholder Categorisation and Mapping

The Stakeholders for the Menengai West Geothermal Drilling Project have been identified and categorized as follows:

3.2.1 Primary Stakeholders

This refers to the category of stakeholders who will be directly affected by the proposed project. They include:

- Project Proponent - GDC focuses on the development of geothermal resources for power production in the area. They will therefore be responsible for the entire project cycle, from inception through construction, operation to decommissioning.
- Project Affected Persons (PAPs); - They will be affected through either loss of land or loss of land use. As such, a study to identify all the PAPs has been conducted and a compensation mechanism developed.
- Potentially Displaced Project Affected persons: Landowners within the project area and those living in the areas where access roads and pipelines will be located
- Vulnerable groups; Stakeholder identification and engagement also seek to identify any potentially vulnerable or disadvantaged group or individuals in the local community. Through a household survey, there were are a number of vulnerable groups within the Project area which include; the elderly, women, widowed, unemployed, children and the disabled.

3.2.2 Secondary Stakeholders

Secondary stakeholders are those who have an indirect interest in the proposed project. They may include:

- National and County government institutions with regulatory functions (e.g. NEMA, WRA, KFS, KWS, Directorate of Occupational Health and Safety Services etc.)
- County leaders (Governor, Senator, MPs, Women Rep, MP, MCAs); The role of the elected leaders is to represent interest of their electorate and hence the County leaders have a great interest in the project to ensure the interests of the communities they serve are safe guarded.

3.2.3 Tertiary Stakeholders

These are stakeholders who can influence the project outcome. They can be grouped as:

- The media - Media are an important stakeholder in this Project not only because they potentially have a significant influence over the local population, but they can also become useful in the dissemination of project related information. Baseline socio economic report findings indicate that majority of households have access to radio and TV respectively. Radio is therefore the most effective mode of information dissemination in the area.
- NGOs, CBOs and FBOs: There are several NGOs and CBOs working within Project area in various fields of development activities including: education, health, sanitation, water supply, agriculture, livestock, women and children issues, saving and credit services, etc.
- International interest groups such as donor agencies; multilateral lending agencies/donors such as Africa Development Bank (AfDB), French Development Bank (AFD) that have led mission to Menengai to assess the viability of the project.

Table 3.1 illustrates how each stakeholder is connected to the Project.

Table 3-1: Relevance of Identified Stakeholders to the Project

Category of Stakeholder	Stakeholder Group	Relevance to the Project
Primary Stakeholders	Geothermal Development Corporation (GDC)	Project Proponent
	Project Affected Persons (PAPs)	Local communities may be adversely affected by construction and operational impacts but also may benefit from employment and indirect economic opportunities
	Potentially Displaced Project Affected persons	Entitles to compensation for land acquired in accordance with the Resettlement Action Plan (RAP) developed as part of the ESIA process

Category of Stakeholder	Stakeholder Group	Relevance to the Project
Secondary Stakeholders	National and County Government Departments • Ministry of Mining	Meeting the requirements of country's geothermal exploration laws and policies during project implementation
	Ministry of Energy	Meeting the requirements of country's energy policy during project implementation
	Energy Regulation Commission (ERC)	To manage the issue licenses for generation, transferring, distribution and selling, as well as the import and export of electricity in the country
	National Treasury	Coordination of financial and economic issues related to project implementation
	National Environment Management Authority (NEMA)	Meeting country's environmental law and the international standards
	Water Resource Authority (WRA)	Safeguarding underground and surface water resources in the project area
	Kenya Forest Services and Kenya Wildlife Services	Forest and Wildlife protection and conservation
	Directorate of Occupational Health and Safety Services	Coordination of health and occupational issues related to project implementation
	Public Health & Sanitation	Coordination of health and sanitation issues related to project implementation
	County leaders	To safeguard interests of the local communities
Tertiary Stakeholders	Media (radio, newspaper, TV, internet)	Informing the local people about the planned activities during project implementation
	NGOs/CBOs/Associations/Civil Society Organizations	Protect the rights of the residents of the local community during project implementation
	Donor Agencies	Their role?????

4 STAKEHOLDERS ANALYSIS AND ENGAGEMENT PLAN

4.1 Introduction

Exploration phase of geothermal development usually involves assessment and confirmation of existence of geothermal energy potential of a Geothermal License Area. Within the Menengai West geothermal area, other land uses which are already on-going within and around the geothermal area are mainly agriculture, residential uses and livestock farming. It is therefore clear that there will be interaction between the local community and the geothermal exploration drillling staff.

The project proponent is therefore mandated to continually engage all stakeholders and project interested parties to ensure that they are informed about the Project's environmental and social performance so that they can provide feedback on the effectiveness of any mitigation and management measures. This will also provide them with an opportunity to raise any concerns or grievances regarding project implementation.

Government regulatory agencies as well as NGOs and CBOs can have a positive influence over the participation of primary stakeholders in participatory monitoring of the project ESMP. Civil society organizations, opinion leaders and political leaders can also play stakeholder mobilisation, community sensitization and advocacy roles.

To avoid the risk of engaging groups with conflicting interests that may use or misuse the information disclosed to their own ends with specific groups among the primary stakeholders, it is critical that the project proponent representative is always present in public meetings to ensure that the correct information is disseminated to all stakeholders in a transparent manner to reduce conflicts arising from miscommunication or speculation. Information disclosure should also be done in a manner that facilitates openness and dialogue in problem solving approaches to grievance management.

For the engagement process to be effective and meaningful, a range of techniques need to be applied specifically tailored to the identified stakeholder groups. The format of every consultation activity should meet general requirements on accessibility, i.e. the consultation events should be held at venues that are easily reachable for all representatives of the community, should not require entrance fees, and are culturally appropriate.

The consultation activities should also be based on the principle of inclusiveness, i.e. engaging all segments of the society, including disabled persons, the elderly, minority groups, and other vulnerable individuals. If necessary, logistical assistance may be provided to enable disadvantaged representatives to attend meetings.

4.2 Stakeholder Analysis

Table 4.1 presents a stakeholder analysis matrix and proposed engagement platform based on their individual influence on the geothermal exploration-drilling project.

Table 4-1: Stakeholder Analysis Matrix

Stakeholder Group	Impact/ Interest	Influence	Proposed Engagement Platforms
Project Affected Persons (PAPs)	High – Most affected communities will potentially experience high degree of impact	High – The direct affected communities have great influence on the project implementation as they are the ones to experience the direct and indirect impacts of the project. Their quality of life can therefore easily by negatively or positively affected by project activities. Project affected communities can therefore be development partners or against the project as an aggrieved group.	• Household Surveys • Focus Group Meetings with community leaders • Public meetings in affected communities • Information dissemination and feedback from Project Proponent through public platforms including public meetings and mass media
National and County Government Departments • **Ministry of Mining** • **Ministry of Energy** • **National Environment Management Authority (NEMA** • • **KFS & KWS** • **Directorate of Occupational Health and Safety Services** • **Public Health and Sanitation**	High (especially the environmental regulators) – National and County Government regulate and oversee environmental and social management programs. They provide licensing and approvals, in accordance with various Laws.	High – They are partners in efficient program implementation. They can also be partners in sharing of practical strategies for environmental and social management. As custodians of government policies and regulations, they hold key information on any updates occurring in the realm of environmental and social management for sustainable development	Information disclosure based on requirements, focused consultation: • Phone /Fax /Email • Occasional one-on-one /focus group meetings as required • Sharing of documents • Recording of comments /feedback on comments • Round table discussions for decision making and consensus.
County leadership	High – in terms of Environmental management, land acquisition, compensation issues and livelihood restoration programs.	High /medium – County government is a key project partner in sustainable development within the Project area.	• One-on-one meetings with local leadership • Partnering in distribution of non-technical Project information, dissemination and feedback from Project Proponent through public

Stakeholder Group	Impact/ Interest	Influence	Proposed Engagement Platforms
			platforms • Round table discussions for problem solving, review an update of procedures for environmental and social management programs including participatory evaluation of the efficacy of the SEP
Media	Medium to High – Mass media provides platform to send out information to a very large population with technological advancement in broadcasting, information can cross international borders. Depending on the situation and /or how information is packaged, the media can be a partner or an adversary to the Project.	MEDIUM - High – Depending on presentation of news and opinions, mass media with clout in a community can influence public opinion towards an organization and its activities.	Press Conference
NGOs/CBOs/Associations/Civil Society Organizations	High – CSOs and NGOs are actors in community development and advocacy especially at the grassroots level. They understand pertinent issues in their areas where they are acting.	High – They can be partners in development interventions by an organization at community levels. They are good informants in participatory, monitoring and evaluation. They can also be adversaries in case of conflicting interests	• One-on-one meetings as required • Focus group meetings
Donor Agencies	High – Development projects funded by donors have to be incompliance with their environmental and social safeguards. Lack of compliance can lead to delay in project implementation through sanctions such as withholding and in very bad cases outright withdrawal from the project.	High– Enforcement of the implementation of environmental and social programs including Monitoring and Evaluation (M&E) and corrective actions is a critical element to sustainable development	Meetings

4.3 Communication Flow among Stakeholders

Since various stakeholder groups are bound to interact with various departments at GDC, there is need for a clear communication loop to ensure that the project proponent staff are aware of their roles responsibilities and mandates with regard to stakeholder engagement. Figure 4.1 shows the anticipated communication flow among various stakeholders.

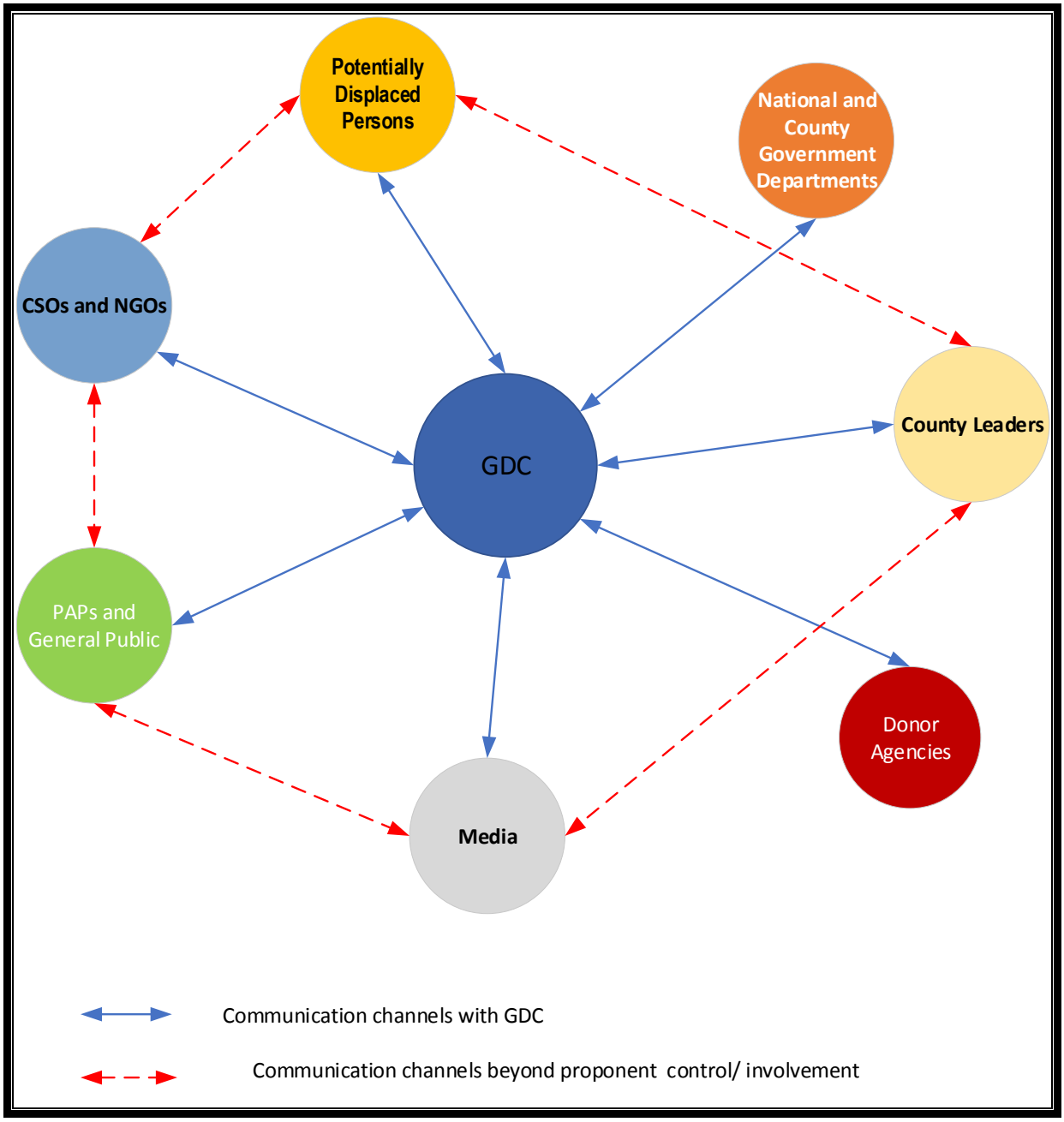

Figure 4-1: Communication Flow among various Stakeholders

The following procedure is proposed to establish a precise entry point into and within GDC and then on to the rest of the stakeholders:

- Interaction with the local community should be from the grassroots to the relevant desk within GDC. As such, continuation of current system of Community Liaison Officer(s) is recommended.
- The community liaison structure should be embedded within an environmental and social management system to ensure comprehensive address of issues arising from environmental and social sustainability issues.
- National and County government agencies are more inclined towards regulatory and overseeing functions in accordance with their mandate. Communication with this group should be therefore be in a formal manner and brought to the attention of GDC management through a designated Environmental, Health and Safety manager (EH&S Manager).
- The EH&S Manager should have access to top management (decision makers)
- Development partners are expected to interact with GDC top management. The feedback loop to and from the grass roots should be through the EH&S Manager and his Community Liaison Officer (CLO).
- The general public and beneficiaries can be engaged through mass media and written communication that should be recorded in a community engagement and / or feedback log.
- It is recommended that direct communication with mass media be done through an in-house or contracted public relations firm

4.4 Description of Stakeholder Engagement Methods

This section outlines information on further stakeholder engagement activities. Procedures for public engagement should be periodically reviewed during M&E of the SEP to adapt to the changes in social structure within the Project area. During the stakeholder engagement process, the following engagement activities are and will be used:

4.4.1 Public Meetings

Public meetings are defined as meetings that are open to everyone with no restrictions on access. They are the best tool to disseminate information at grass root levels as they allow for real time clarifications on misconceptions, misinformation and false perceptions and fears. Public meetings have unrestricted access and hence can have an attendance of more than one hundred persons. The key to such high attendance lies in adequate mobilization. Critical aspects to consider when organising for a public meeting are:

- Authority for conducting a public meeting must be granted by the county commissioner and the public administration through an introductory letter
- A 3 to 4 days' notice should be issued for a public meeting
- Supplementary notices for meetings can be given through public posters at sub location level
- Adequate mobilization to ensure proper representation of community members
- Promotion of participation: Even though public meetings are not suitable for in-depth discussions, in order to promote participation, the convener should ensure that all factions represented get a chance to participate

- All minutes of public meetings meeting to be well documented and signed by the convener of the meeting

4.4.2 Workshops & Seminars

Workshops and seminar are good tools to deliberate on crosscutting issues. Attendance is controlled through formal invitations to ensure that an optimum number attends. Workshops can also be used to disclose critical findings and seek validation to assumptions and proposed mitigation measures. It is therefore important to ensure that the target groups are well represented by stakeholders from both public and private sectors. Community participation can be enhanced through nomination or election of representatives.

Use of visual aids such as maps, presentations and panels provide good reference materials during the workshop sessions. It is therefore important that workshop materials are prepared adequately in advance for dissemination to attendees. Information packages can also be prepared and distributed to attendees to carry with them after the workshops. Records of workshop proceedings can be kept in the form of minutes, reports and video recordings.

4.4.3 Round Table Meetings

Round table meetings consist usually of smaller number of attendees (10-15 persons) to facilitate in-depth discussion, consensus building, conflict resolution and decision making. They are usually based on a certain issue and thrive best when there fewer agendas for discussion.

A round table meeting should therefore target stakeholder representatives with the authority to speak and make decisions on behalf of the larger group. Inclusion of mandated government official usually lends further credibility and continuity on decisions made. Community representation has to be by bona fide leaders who have been endorsed by the larger community. Community mobilisation for selection, election or nomination and validation should therefore be done before this platform can be used.

The principle of prior informed consent should be upheld at all times to avoid reneging on agreements made. Sometimes there is need for technical expertise and even legal representation in such meetings. Rule of engagement should also be discussed and agreed including the mandate of all present. Records of round table meetings proceedings can be kept in the form of minutes of discussions and deliberation, agreement and in some cases memoranda of understanding.

4.4.4 Focus Group Discussions

Focus group discussions are mainly composed of about 10 to 15 people with similar backgrounds or experiences meeting to discuss specific topics of interest or issues that directly affect their wellbeing. FGDs are led through by a skilled moderator in terms of understanding the issues as well as skills in simulating discussion especially among quieter member of the group.

Notice for meeting should be through the public administration. Emphasis should be made to ensure that those interest groups are clearly represented. Participation by CSOs and NGOs should be

encouraged. FGDs can also be organised for government agencies to discuss crosscutting issues such as pollution management, gender mainstreaming, livelihood restoration, benefit sharing and corporate social responsibilities.

Records of deliberation are kept in the form of notes of the meeting. Photos of the meetings are equally important as evidence of the meetings. Contact sheets are a good source for developing a stakeholder database.

4.4.5 Key Informant Interviews

One on one interviews can either be guided (using an interview schedule) or open ended. They are usually done with key informants but require triangulation with outcomes of other stakeholder engagement platforms to avoid bias. Guided interviews are best for record keeping purposes as they allow the interviewer to cover as many sub issues as possible.

Records of deliberation are kept in the form of notes of the meeting. Photos of the meetings are equally important as evidence of the meetings. Contact sheets are a good source for developing a stakeholder database.

4.4.6 Press Conferences

Press conferences can be used to present an organizations position of the greater public. Press conferences should be supported with a clear communication strategy. Public Relations firms are good resource to guide an organization on proper planning and execution of communication strategies through mass media.

5 GRIEVANCE REDRESS MECHANISM

5.1 Overview

Grievances can be an indication of growing stakeholder concerns (real and perceived) and can escalate if not identified and resolved. Identifying and responding to grievances supports the development of positive relationships between projects, communities and other stakeholders.

A grievance management process will be established for the Project. This will provide a formal and on-going avenue for stakeholders to engage with the Project. This grievance mechanism will be accessible to all sections of the affected community, at no cost and will not impede access to other judicial or administrative remedies. Affected communities will be repeatedly informed about the grievance process over the course of community engagement activities.

Stakeholders will be able to share their opinions and grievances via a range of options such as web sites, letters and face to face meetings during all future phases of the Project. Feedback will also be provided to demonstrate how their comments and suggestions have been incorporated into the Project decision-making process in the second public participation meeting and this process will be continue in all phases of the Project. A separate grievance mechanism will be established for Project workers.

Grievance procedures will be coordinated through the nominated Grievance Officer who will feed the grievances through to the Project Company's Public Relations Officer PRO, who is the primary interface between the community and the Project Company. Confidentiality procedures will be put in place to protect the complainant, as appropriate.

5.2 The Grievance Redress Mechanism

There are 10 steps that complete the grievance mechanism. This process has been summarized in Figure 5.1 below and include the following:

Step 1: Identification of Grievance through personal communication with trained project workers or PRO. This could either be in person, by phone, letter, or email

Step 2: Grievance is recorded in the 'Grievance Log' (paper and electronic) within one day of identification. The grievance log should be held and managed by the Public Relation Officer. The significance of the grievance will then be assessed within five to seven days using the criteria outlined in Table 5.1.

Table 5-1: Criteria for assessing the grievances

Level 1 Complaint: A complaint that is isolated or 'one-off' (within a given reporting period - one year) and essentially local in nature. Note: Some one-off complaints may be significant enough to be assessed as a Level 3 complaint e.g.,

when a national or international law is broken (see Level 3).

Level 2 Complaint: A complaint that is widespread and repeated (e.g., dust from construction vehicles).

Level 3 Complaint: A one-off complaint, or one which is widespread and/or repeated that, in addition, has resulted in a serious breach of the Project Company's policies or National law and/or has led to negative national/international media attention, or is judged to have the potential to generate negative comment from the media or other key stakeholders (e.g., inadequate waste management).

Step 3: Grievance is acknowledged through a personal meeting, phone call, or letter as appropriate, within a target of 10-14 working days after submission. If the grievance is not well understood or if additional information is required, clarification will be sought from the complainant during this step.

Step 4: The Grievance Officer is notified of Level 1, 2 or 3 grievances and the Project Manager/Director is notified of all Level 3 grievances. The senior management will, as appropriate, support the Grievance Officer in deciding who should deal with the grievance, and determine whether additional support for the response is necessary.

Step 5: The PRO delegates the grievance within five to seven days via e-mail to relevant department(s)/personnel to ensure an effective response is developed (e.g., HR, relevant administrative departments, contractors etc.)

Step 6: A response is developed by the delegated team and PRO within 14 days, with input from senior management and others, as necessary.

Step 7: The response is signed-off by the senior manager for level 3 grievances and the PRO for Level 2 and Level 1 grievances within 14 days. The sign-off may be a signature on the grievance log or an e-mail which indicates agreement, which should be filed by the PRO and referred to in the grievance log.

Step 8: Communication of the response should be carefully coordinated. The Public Relation Officer (PRO) ensures that an approach to communicating the response is agreed and implemented.

Step 9: Record the response of the complainant to help assess whether the grievance is closed or whether further action is needed. The PRO should use appropriate communication channels, most likely telephone or a face to face meetings, to confirm whether the complainant has understood and is satisfied with the response. The complainant's response should be recorded in the grievance log.

Step 10: Close the grievance with a sign-off from the PRO. The PRO assesses whether a grievance can be closed or whether further attention is required. If further attention is required the PRO should return to Step 2 to re-assess the grievance. Once the PRO has assessed whether the grievance can be closed, he/she will sign off or seek agreement from the Project Manager for level 3 grievances, to approve closure of the grievance. The agreement may be a signature on the grievance log or an equivalent e-mail, which will be filed by the Grievance Officer and referred to in the grievance log. This process is outlined in Figure 5.1.

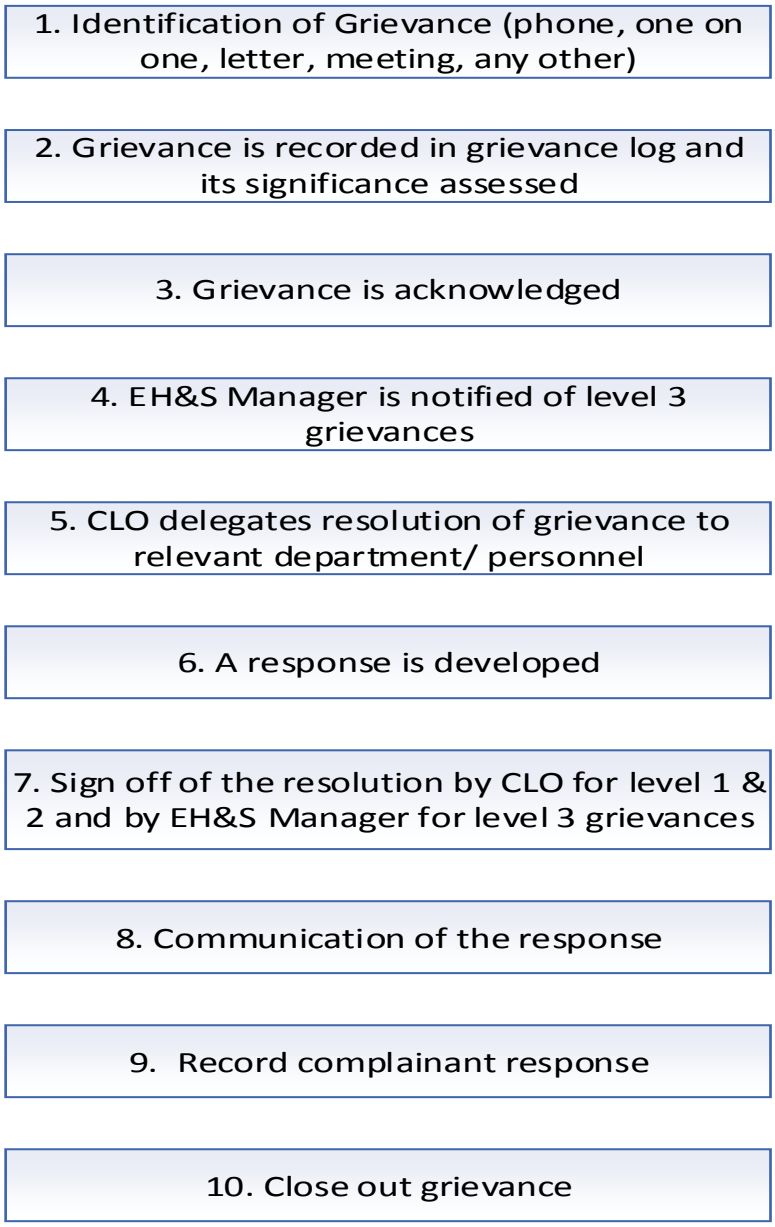

Figure 5-1: Flow Chart for Processing Grievances

5.3 Grievance Procedure Channels of Communication

Numerous channels will be used for stakeholders to submit any complaints and requests:

i. **Telephone** – All incoming calls will be registered and information summarized daily and sent to the relevant department for processing and action in accordance with the grievance procedure outlined above.
ii. **Electronic channels** – Stakeholders have the opportunity to send comments, remarks, requests and complaints via the official website of the Project Company.
iii. **Post** – Mail can be used by stakeholders for submission of their queries/requests/complaints/comments for consideration by the PRO. All incoming letters will

be documented and stored as well as the responses sent to the originating party in accordance with the grievance procedure outlined above.

iv. **Verbal** - Any queries/requests/complaints/comments can also be brought to the attention of the Project Company verbally or written (e-mail) or by filling in a Grievance Form which will be available in the project site office (See Appendix 1).

6 RESPONSIBILITIES AND RESOURCES REQUIRED FOR SEP IMPLEMENTATION

6.1 Responsibilities for SEP Implementation

6.1.1 Top Management

Decisions on an organisation's policy and approach are driven by top management. The Project proponent, GDC will be responsible for monitoring the overall effectiveness of the monitoring measures detailed in the project ESMP.

Top management are tasked with defining the information to be disclosed to the public. In cases where grievances arise, some decisions cannot be made at the lower levels of management. Other decisions carry grave consequences and therefore lower cadre staff may not have the authority to make announcements to the stakeholders. Top Management are therefore critical players in stakeholder engagement.

6.1.2 Environmental, Health and Safety Manager

The EH&S Manager is tasked to oversee all planned stakeholder engagement activities throughout various project phases. He should also ensure that all stakeholder engagement aspects are deliberated upon on high-level management agendas, and that all actions arising from management decisions are implemented.

6.1.3 Community Liaison Officer/ Public Liaison Officer/Manager Community Relations

The Manager Community Relations/Community liaison officer will be tasked with direct engagement with community members and documentation of all grievances. His/her main responsibilities to entail:

- Engage with communities on a continuous basis to strengthen relationships between the proponent, GDC and affected communities
- Assist with stakeholder engagement and identification and management of grievances and concerns
- Manage stakeholder engagement logistics such as collecting grievances from suggestion boxes, and arranging community meetings
- Provide weekly reports to EH&S manager on consultations, attendance, concerns, grievances, risks etc.
- Look out for environmental, social, health & safety non-conformities and assist in corrective actions

6.2 Resources Required to Implement the SEP

6.2.1 Equipment and Office Space

It is proposed that a fully furnished office with computers and stationery be set in the Project area to coordinate field activities.

6.2.2 Capacity Building

To improve the capacity of the Community Liaison Officers/Environmental Officers, the proponent, GDC may consider organising training on the following aspects:

- Consultation and public participation
- Crisis management and support services
- Conflict management and resolution
- Negotiations and problem solving skills
- Communication skills
- Report writing

6.2.3 Stakeholder Engagement Materials

The following documents can be used to generate records for stakeholder engagement. These include:

- Grievance logging form – will guide various community members and affected parties to raise complaints and grievances and allows the Project to respond to and resolve the issues in an appropriate manner.
- Grievance Closure form – can be used to track grievances and concerns from the time it was registered up to the time of making resolution. It would be signed by officers concerned.
- Grievance and Concerns logging database – for registering and developing record of all grievances that are reported to the community liaison officers
- Stakeholder Register - can be used to document all stakeholders, providing their contacts and the level of influence.
- Comments and Concerns Register – can be used to ensure that accurate and detailed record of information and views is gathered at every stakeholder meeting, with a consultation meeting note also written up. Prior to all consultations, responsibility could be appointed to one member of the Project team to take detailed notes and write up these notes immediately after the consultation using a consultation note format. These minutes must be signed after the meetings.

Samples of these forms are presented in Appendix I and II.

6.2.4 CSR Activities

Some of the proposed CSR activities within the project area which the proponent can support include;

- Water; Rehabilitate dilapidated water tanks, sink water boreholes
- Education; Increase number of classrooms on need basis, roofing, provide bursaries to needy students
- Roads; Rehabilitate existing roads

Training; Training of locals on technical skills

7 APPENDICES

7.1 Appendix I Sample of Grievance Logging Form

Note: you can remain anonymous if you prefer or request not to disclose your identity to the third parties without your consent.

Reference No.	
Full Name	
Please mark how you wish to be contacted (mail, telephone, email	By Post: Please provide mailing address _____ By telephone: _____ By e-mail: _____
County, Sub county, Location, Sub location	
Date	
Category of Grievance	
1. Assets/properties impacted by the project	
2. Infrastructure	
3. Decrease or complete loss of sources of income	
4. Environmental issues (like pollution)	
5. Employment	
6. Traffic, transportation and other risks	
7. Land allocation	
8. Compensation	
9. Other (Please specify):	
Description of the Grievance What did happen? When did it happen? Where did it happen? What is the result of the problem?	
What would you like to see happen to resolve the problem?	

Signature Date

7.2 Appendix II Sample of Grievance Closure Form

Note: you can remain anonymous if you prefer or request not to disclose your identity to the third parties without your consent.

Reference No.	
Define immediate action required	
Define long term action required (if necessary):	
Is compensation required?	1. Yes 2. No
Stages of the Remediate Action	Deadline and Responsible Institutions
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

This part will be filled and signed by the complainant after s/he receives the compensation fees and his/her
complaint has been remediated.

PRO of Representative of PRO

Name of the Complainant: _____ Name: _____

Date: _____ Date: _____

Signature: _____ Signature: _____

CONSULTANCY SERVICE FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED MENENGAI WEST GEOTHERMAL DRILLING PROJECT, NAKURU COUNTY

VOLUME II

LAND ACQUISITION AND COMPENSATION PLAN

Final Report

February 2019

DRAFT FINAL REPORT

CONSULTANCY SERVICE FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED MENENGAI WEST GEOTHERMAL DRILLING PROJECT, NAKURU COUNTY

Submitted to:

(Client)

Geothermal Development Company

Submitted by:

(Consultant)

Log Associates Limited

Submission Date: **February 2019**

Version: **02**

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EXECUTIVE SUMMARY

I. Preface

This report was prepared for Geothermal Development Company (GDC) by *Log Associates*. It sets out the procedures to be followed and the actions to be taken to ensure proper land acquisition and compensation (LAC) for the proposed wells drilling and associated infrastructure plan under the proposed Menengai West Geothermal Drilling Project. The Report has been developed in accordance with the Laws of Kenya and international best practices.

II. Project LACP Overall Objective

The overall objective was to develop a Land Acquisition & Compensation Plan (LACP), resettlement guidelines, and livelihood restoration plans for the project affected persons (PAPs).

III. Legal and Regulatory Framework

This LACP has identified and reviewed all laws applicable to acquisition of land, wayleave access and involuntary resettlement. It has been prepared in line with Kenyan law and best international practices.

IV. Socioeconomic Profile of the PAPs

Analysis of the socioeconomic data revealed as follows:

- **Age and sex distribution**: Distribution of population by sex showed that 33 percent were female and 67 percent were male. A total of 37 per cent of the respondents are aged between 46 – 60 years, while 27 per cent of are aged between 36 – 45 years. The results also reveal that 36 per cent of the PAPs are aged above 60 years. This group is considered vulnerable, as members of such group require special assistance to restore their income and/or livelihood status if affected.
- **Education and Literacy**: That 37 per cent of the respondents had attained basic primary education, 36 per cent had attained secondary education, 9 per cent have studied up to the post-secondary level and that 9 per cent never attended school.
- **Economic conditions and livelihood activities:** Crop farming accounted for 93 per cent of the total household income. Other income sources included casual employment, business and formal employment.
- **Sources of Water:** Water is one of the biggest challenges facing the PAPs. Even though this is problem facing the wider Nakuru County, the PAPs problem has been exacerbated by the terrain and the fact that they are on higher grounds, which makes the cost of pumping very expensive. 33 Percent of PAPs get their water through water venders, 43 Percent Piped water supply and 25 Percent from water kiosks. While GDC will require water for the drilling project, it was a general request that the Company should consider community needs in their design.
- **Vulnerable PAPs:** A total of 36 per cent of the PAPs are aged above 60 years; this group is considered vulnerable, as members of such group require special assistance to restore their income and/or livelihood status.
- **Property Ownership:** About 78 per cent of the respondents had their land falling within the proposed project area. Majority did not have any structures within these areas. However, farmlands are affected.
- **Accessibility of Social Structures:** Twenty-eight per cent of the PAPs reported that primary school was the closest public facility to them, 36 per cent could access a road, and 36 per cent could access health facility. Water point and secondary school were farthest from the project areas.

V. Identification of Project Impacts

We identified the project impacts as displacement affected by proposed well sites loss of land, loss of structures and loss of trees

VI. Compensation for Losses

The computed total compensation is as follows:

- Cost of leasing land for 5years was found to be **KSh 17,486,160.00**
- Cost compensation for the affected structures was found to be **KSh 1,191,033.84**
- Compensation for Trees/Crops/Fruit Trees **KSh 768,000**
- Economic Rehabilitation Cost **KSh 845,601.576**

VII. Cut off-date

Census and inventory of lost assets was completed on 15 November 2018, which effectively became the cut-off-date, i.e the last day of socio-economic survey and inventorization of PAPs.

VIII. Recommendations

From the study findings, we recommended as follows:

i. **Consultations:** Project affected persons should be consulted continually about the resettlement plan and implementation of the same prior to commencement of construction activities. Particular attention should be given to vulnerable groups such as the elderly, female headed households, the sick, the orphans and the internally displaced persons.

ii. **LACP Budget:** The proponent should set aside a budget of **KSh 23,706,286.00 (inclusive of 10% contingency)** for the implementation of LACP

iii. **Compensation:** The compensation package provided in this report is based on fair market values. We recommend that same should be made before commencement of the proposed project implementation through the proponent office. A minimum of three (3) months' notice should be given to the PAPs to enable them salvage all their assets. In case cash compensation would not be the preferred option, the proponent should consider other methods of compensation such as *structure for structure*. In the case of absentee landowners or compensation under dispute, GDC should set aside sufficient funds in an escrow account or similar financial instrument to cover unpaid compensation.

iv. **Monitoring and Evaluation:** Monitoring and evaluation should be a continuous process. GDC will be responsible for all aspects of internal monitoring. An external consultant, if deemed appropriate, knowledgeable in resettlement matters should be appointed to carry out external monitoring and evaluation.

v. **Community Expectations:** The PAPs raised issues especial on water supply and access to good road for the attention of the project proponent. These issues should be taken seriously to minimize complaints, grievances and potential delays.

vi. **Disturbance Allowance:** Add a sum equal to 15% of the fair market value by way of compensation as disturbance and enlighten the community members on the legal restrictions that govern the process.

ABBREVIATIONS

FMV	Fair Market Value
GDC	Geothermal Development Company
GPS	Global Positioning System
HH	Household
KES	Kenya Shillings
LAC	Land Acquisition and Compensation
LACP	Land Acquisition and Compensation Plan
MDG	Millennium Development Goals
NGO	Non-Governmental Organisations
OMV	Open Market Value
PAP	Project Affected Person
PC	PAP Committee
PC&D	Public Consultation and Disclosure
PDPs	Project Displaced Persons
RAP	Resettlement Action Plan
RoW	Right of Way
RPF	Resettlement Policy Framework
LACPT	Land Acquisition and Compensation Project Team
LACWG	Land Acquisition and Compensation Working Group
SPSS	Statistical Package for Social Scientists
UTM	Universal Transverse Mercator Coordinate System

DEFINITION OF KEY TERMS

Compensation	means payment in cash or kind for an asset to be acquired or affected by a project at replacement cost.
Cut-off-date	means the date after which people will NOT be considered eligible for compensation i.e. they are not included in the list of PAPs as defined by the census.
Encroachers	mean those people who move into the project area after the cut-off date and are therefore not eligible for compensation or other rehabilitation measures provided by the project.
Entitlement	means the range of measures comprising cash or kind compensation, relocation cost, income rehabilitation assistance, transfer assistance, income substitution, and relocation which are due to /business restoration, which are due to PAPs, depending on the type and degree nature of their losses, to restore their social and economic base.
Income Restoration	means the measures required to ensure that PAPs have the resources to *at least* restore, if not improve, their livelihoods.
Non-titled	means those who have no recognizable rights or claims to the land that they are occupying.
Project Affected person (PAP)	means the same as displaced person within the meaning of World Bank's policy OP 4.12, and means any person experiencing effects from land acquisition regardless of whether they are physically displaced or relocated or not.
Resettlement plan	means the time-bound action plan with budget setting out resettlement strategy, objectives, entitlements, actions, responsibilities, monitoring and evaluation.
Vulnerable	means any people who might suffer disproportionately or face the risk of being marginalized from the effects of resettlement i.e; (i) female-headed households with dependents; (ii) disabled household heads; (iii) poor households; (iv) landless elderly households with no means of support; (v) households without security of tenure; and (vi) ethnic minorities.

1 INTRODUCTION

1.1 Background

Geothermal Development Company is mandated with development of **5,000MW** of geothermal power by 2030. The geothermal resources are spread across more than 14 geothermal prospects across the Kenyan Rift i.e. Menengai, Olkaria, Suswa, Longonot, Eburru, Arus-Bogoria, Lake Baringo, Korosi, Paka, Lake Magadi, Badlands, Silali, Emuruangogolak, Namarunu and Barrier – Kenya (Figure 1-1 below). The Greater Menengai geothermal project is among the more than 14 high temperature geothermal areas within the Kenyan Rift being developed by GDC for geothermal energy utilization.

Figure 1-1: Geothermal fields in Kenya

(Source: Proceedings World Geothermal Congress 2015)

The proposed Menengai West geothermal project is located west of the Menengai caldera. Geoscientific surveys including geology, geochemistry and geophysics were carried out by GDC where five (5) exploration wells were sited. Results indicate that Menengai West project location may be hosting a high temperature geothermal system. Drilling in this field was scheduled to commence after acquisition of necessary permits and licenses. In 2008, ESIA for Menengai Caldera Project area was done by NEMA

registered EIA/Audit Team of Lead Experts. The project and ESIA reports were prepared and submitted to NEMA, which issued EIA License No. NEMA/EIA/VEIA/193.

Financing of Menengai Geothermal drilling project has been through the Government of Kenya i.e. Treasury through the Ministry of Energy and Petroleum (MoEP) and other Multilateral lending agencies/donors such as Africa Development Bank (AfDB), French Development Bank (AFD) among others. Most of these banks have led mission to Menengai to assess the viability of the project of which ESIA study report has been one of the key documents guiding their assessment.

The Environmental Management and Coordination (EMCA) Act, 1999 requires that an Environmental Impact Assessment (EIA) is undertaken for proposed activities that are likely to have a significant adverse impact on the environment and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The second schedule of the EMCA Act, 1999 provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority. The proposed Geothermal Drilling Project falls within the second schedule of the EMCA Act (Revised 2015) under '*Mining including quarrying and open cast extraction of Geothermal energy exploration and production*' and this is what informed this study report. The proponent has commissioned the Environmental and Social Impact Assessment study in compliance with the Act.

1.2 LACP Objectives and Principles

1.2.1 Overall Purposes

The overall purpose of the Land Acquisition & Compensation Plan (LACP) is to provide guidelines for the management of land acquisition and/or acquisition of access rights by the project in a manner that is orderly and compliant to the relevant laws, policies and best practices.

1.2.2 Objectives

The specific objectives of the LACP process are as follows:

- Avoidance or minimization of resettlement and/or economic displacement
- Mitigation of adverse social and economic impacts from land acquisition
- Provision of timely compensation for loss of assets at a level that improves the livelihoods of the affected persons
- Improvement or, at a minimum, restore the livelihood and standards of living

1.2.3 LACP Principles

Key principles which guide the LACP process are as follows:

- **Compliance with the law:** Livelihood restoration and compensation of PAPs to be carried out in line with relevant laws
- **Comprehensive ESMP**: Both physical and economic losses to be considered and adequate mitigation measures be factored in the ESMP
- **Compensation for short term impacts:** Short term impacts related to temporary occupation

of land for construction purposes may also entail compensation or other assistance

- **Legal Entitlements:** Entitlements of all categories of affected peoples (including informal land users) has to be established
- The affected assets or resources, or the access thereto and livelihood impacts, have to be valued
- Affected properties, especially structures shall be compensated regardless of formal title
- Livelihoods and standards of living of affected persons shall be improved or at least restored to pre-project levels
- All owners, occupants and users of affected land and structures at the time of the cut-off date (15 November 2018) with or without fully recognised ownership rights are eligible for compensation, livelihood restoration and/or assistance
- Procedures will also be adopted to compensate PAPs with recognisable right to land and property where owners remain unknown at the cut-off date
- Compensation shall be provided prior to any relocation or access to land
- All transactions to acquire land rights, as well as compensation measures, livelihood restoration activities and other assistance shall be documented
- PAPs to be provided opportunities to participate in decision making processes through inclusive and meaningful public consultation processes
- Specific grievance management mechanism shall be set up for PAPs and all questions, queries or grievances shall be recorded in a grievance log
- Monitoring and evaluation procedures shall be set up to measure the effectiveness of livelihood restoration and resettlement measures
- **Disclosures:** GDC shall make every effort to ensure that all information relevant to the PAPs with regard to the project shall be disclosed to the PAPs through appropriate forums

1.3 Potential Drilling Areas

1.3.1 Proposed Project Location and Layout

The proposed project will be conducted in Nakuru County, Kenya. The area referred to as "Menengai West Geothermal Prospect" is located west of the Menengai caldera in the Kenya Rift valley. The Menengai geothermal area is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi, Kenya. The proposed project area is located along the Ol'Rongai Hills located on the western side of the Menengai Caldera. The major town centers around the proposed site include Ol'Rongai, Kwa Gitau and Rigogo. (Figure 1-2)

The Menengai west geothermal project falls on the western side of the Menengai caldera floor. The caldera floor, which is fairly plain, covers an area of about 88 km^2 and is partially covered by young rugged lava flows. The Menengai west floor extends around Boita, Menengai Station, Ngata Farm and Kabarak Estate, the topography is made up of flat grounds whose relief is low. The prevalently flat area north of Menengai between Mogotio, Kampi ya Moto, Kisanana and the Bahati Escarpment is enlivened by north trending, double chain of Ol"Rongai volcanic centres by the roughly triangular, flat topped El Bonwala Hill and by arcuate chains of small hills that span from the Ol"Rongai Estate to the Athinai Estate. East of the area is bound by the alignment of the Bahati Escarpment and the Marmanet rift cliffs bind the northeastern part.

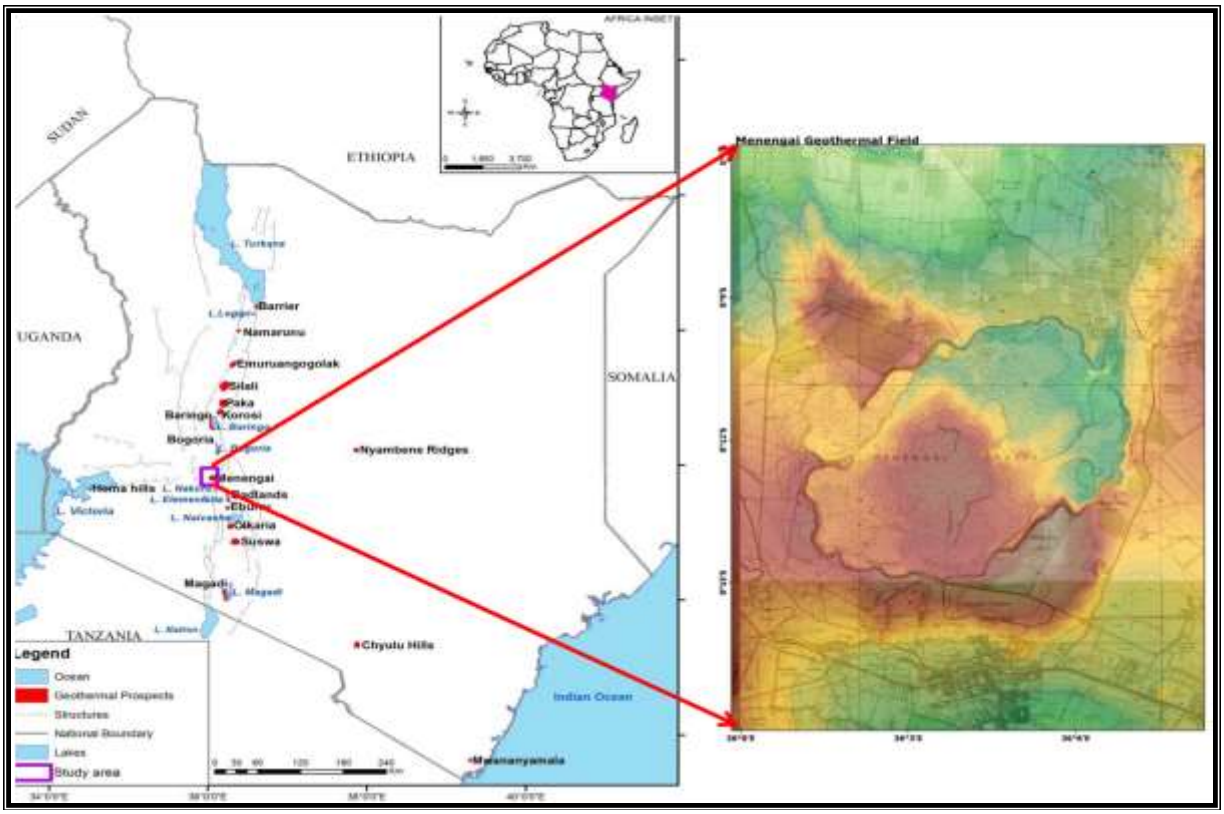


Figure 1-2: Map of Kenya showing the location of the Menengai geothermal exploration site

(Source GRC: Transactions, Vol. 36, 2012)

The following map (Figure 1-3) shows the specific geographic location of the project area.

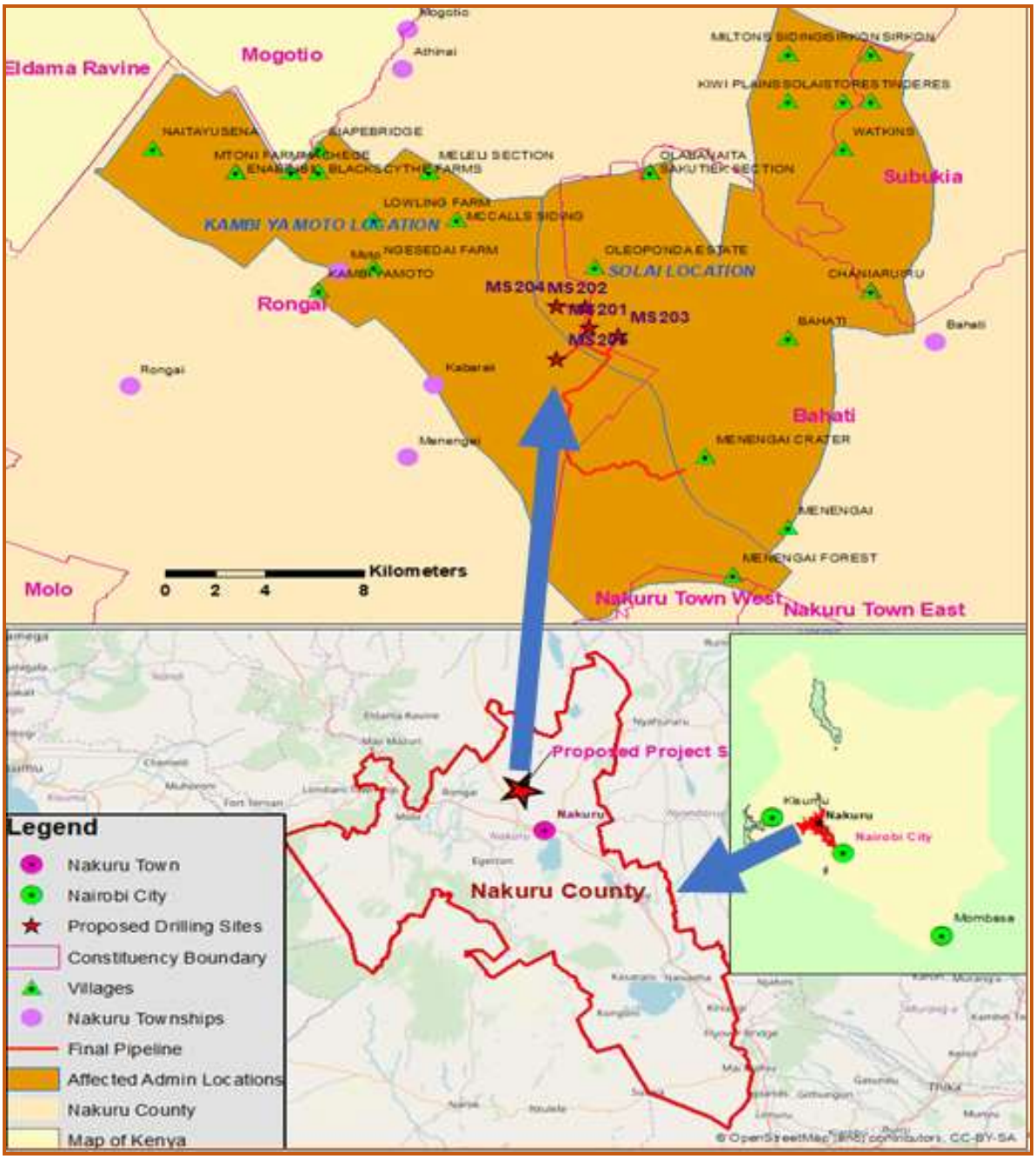


Figure 1-3: Map showing the proposed project location

1.3.2 Proposed Drilling Sites

The project would involve geothermal exploration drilling in the five sites. The potential drilling areas shown on Figure 1-4 below has captured more land than would be needed during the geothermal exploration program. Larger areas were identified to provide flexibility for selecting suitable drilling sites.

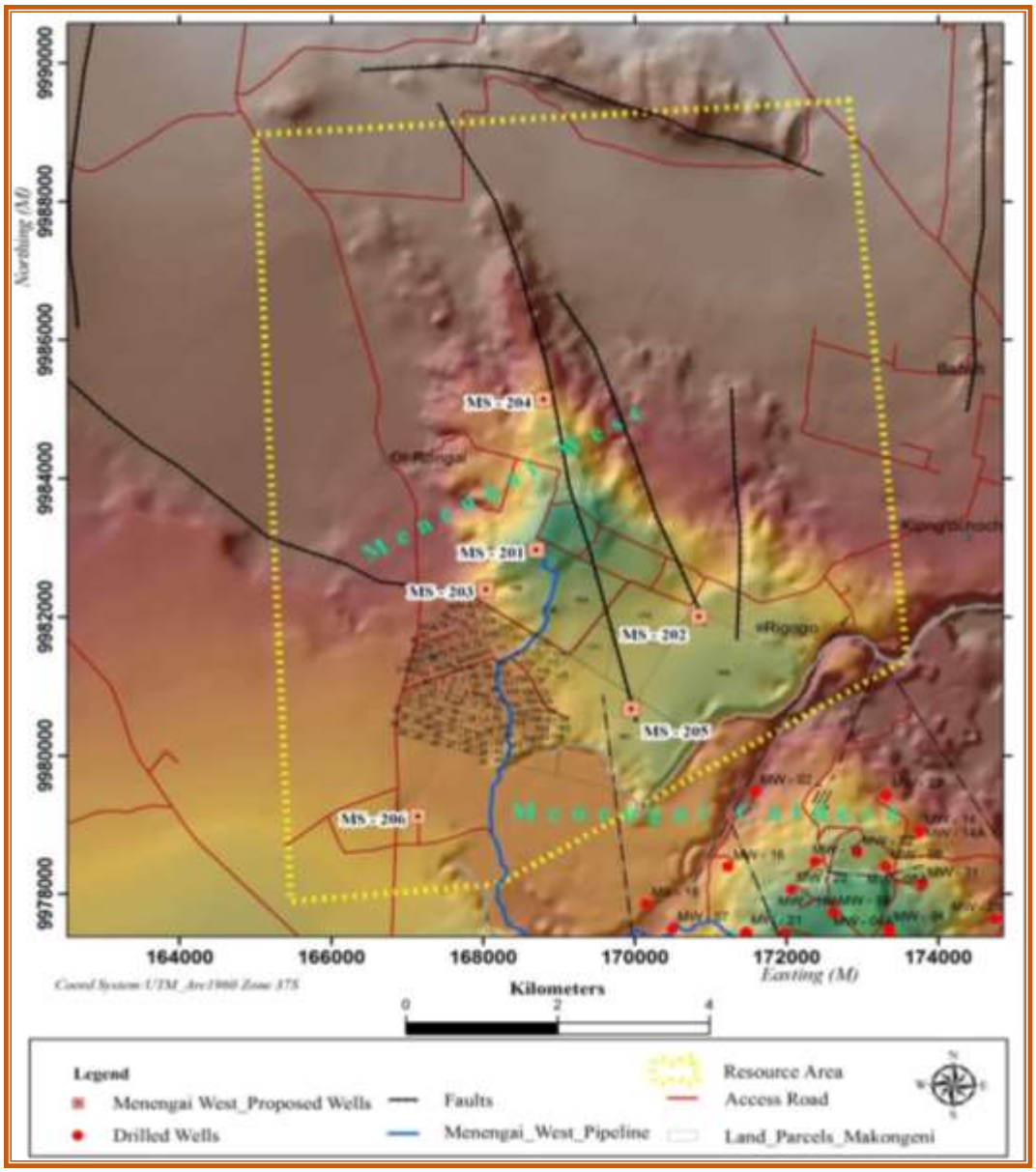


Figure 1-4: Potential drilling area, showing more land than would be needed

Table 1-1 below gives the coordinate locations of the specific five wells using the Coordinate System UTM Arc 1960 Zone 37s.

Table 1-1: Proposed Well Site Coordinates

SNo.	Name of Proposed Sites	Easting's	Northings	Relative Elevation
1	MS 201	169139	9983845	2042.05
2	MS 202	168984	9984832	1999.81
3	MS 203	170282	9983478	1958.32
4	MS 204	167806	9984870	1925.75
5	MS 205	167828	9982410	1956.34

2 PROJECT DESCRIPTION

2.1 Overview assurance

Geothermal Exploration is a process normally conducted in phases. The drilling mechanism for the initial exploration phase consist of drilling exploratory wells in the resource target areas to evaluate sub-surface conditions and determine if there are indications of presence or absence of a commercially developable geothermal system. This section describes the drilling process, project components, and key activities that would be undertaken during implementation of the proposed project.

2.2 Drilling Process

The exploration process begins with drilling and testing exploratory wells to obtain information on the geology and temperature gradient in the area. The well drilling results is evaluated before determining the next drilling location and well design. If the exploratory drilling program indicates there may be a commercial resource, appraisal geothermal wells could be drilled in the potential area.

Large diameter geothermal wells will be drilled with larger drilling rigs. The approach for selecting the specific locations of exploration wells, including their depth and diameter, depend on a range of factors such as access to funds, land accessibility, environmentally and culturally sensitive areas, identification of feasible well pad locations, and eventual power plant development potential.

The proposed Menengai West Geothermal Drilling Project have a conceptual design similar to those of the Menengai Caldera Project. It may include drilling exploratory, appraisal and production wells to evaluate the feasibility of commercial geothermal development from the western side of the Menengai Caldera (proposed project area). Well testing activities include down hole, completion and other scientific tests. The exact number of production wells will be determined by the average output of each well. Currently, five (5) exploration wells i.e. 201, 202, 203, 204 and 205 have been sited. The wells will be drilled to economical depths of approximately 3000 m to access geothermal fluids.

Full-sized large diameter (7-inch+ bottom hole diameter) geothermal exploration wells will be drilled in the proposed wells sites MS 201, MS 202, MS 203, MS 204 and 205.

The project description and analysis in the ESIA address drilling full-sized large diameter wells for the exploratory drilling program.

The proposed project would include the following activities and components:

- Civil works and site development at the potential drilling sites
- Drilling up to five drilling of full-size large diameter wells.
- Well testing
- Decommissioning (Well abandonment and site reclamation depending on the exploration outcome)

2.3 Site Development, Civil Works, and Supplies

Table 2-1: Description of key proposed project components during the civil works

Key Project Components	Description
Equipment and Material Sources	Where applicable, equipment and materials will be sourced locally, if available. It is however expected that some equipment and materials would have to be shipped into the country, through either Port of Mombasa, or the Jomo Kenyatta International Airport, Nairobi, Kenya. Existing infrastructure at both Ports are adequate accommodate project needs and is the preferred method of obtaining large equipment and materials for the project. The equipment shall reach the site via the road infrastructure. Only sections of the all-weather roads leading to the proposed sites shall require rehabilitation to accommodate smooth transportation of the equipment and materials.
Access Roads	The equipment and materials would be transported from the ports to the exploration target areas using a network of existing paved and unpaved roads, as well as new access roads within the drilling target areas. Existing roads may also be improved by increasing the width at certain sections to accommodate the turning radius for vehicles and drilling equipment, and by reinforcing unpaved roads leading to the drilling target areas. Access roads would be improved or constructed as needed by removing trees and vegetation, grading, installing fill dirt, and/or installing gravel. If necessary, retaining walls along access roads would be installed or replaced consistent with engineering requirements. Fill material and gravel used for access roads would be purchased from local suppliers. The anticipated volume of fill material and gravel is expected to be minor, given that the well pad locations would be chosen at sites close to existing roads. Access roads would be established with a width of approximately 4 to 6 meters (which is already provided in the existing roads and wayleaves). Improvement (and where necessary, construction of new access roads) would occur immediately before well pad development. A drilling rig capable of completing the slim-hole wells is approximately 3 meters (about 10 feet) wide. Existing bridges and culverts would be reinforced or replaced, where necessary. Temporary or permanent drainage crossings would be installed as needed to accommodate equipment access. These crossing could include bridges, culverts, steel plates, and rock. Temporary crossing materials would be removed from drainage crossings following construction.
Equipment and Material Storage	Equipment and material storage sites would be developed near each drill pad or as close as possible if space is limited. The total space needed at each location would be approximately 0.1 to 0.2 hectare (0.25 to 0.5 acre). If necessary, storage sites would be cleared of vegetation and graded prior to use. Gravel and drainage materials may also be installed to facilitate all weather access. Equipment and materials at the storage sites would be transported to and from well pads and other project sites, as needed. If necessary, a security fence and lighting would be installed around the storage sites, and security guards may be stationed at the sites.
Workers Camp	If required, a worker camp would be established in the project areas to house the construction workforce during exploration activities in each area. Typically, the worker camp could house up to 50 workers and could include separate sleeping and bathing facilities for men and women, safe food and drinking water, air conditioning, first aid and medical facility, water storage, generators for electricity, and access to communication networks. If necessary, a security fence and lighting would be installed around the worker camp, and security guards may be stationed at the camp.

Well Pads	Well pads would be developed at each drilling location where the drilling equipment and materials would be positioned. A well pad for a exploratory wells are generally 100 by 100 meters or approximately 0.8 to 1.6 hectares (2 to 4 acres) in size. Well pads generally include the equipment and components listed below; The characteristics of full-sized large diameter wells are described further in Section 2.4.3 of the Main ESIA Report • Drill rig • Well head • Blowout prevention equipment • Power supply engines • Fuel tanks • Accumulator • Pipe racks • Drilling mud tanks • Drilling mud pumps • Water storage tanks • Water supply pipelines • Mixing tanks • Reserve pit • Office space • Storage space • Fire-fighting equipment • Parking space Well pad development would include removing vegetation (including trees). The ground surface would be prepared by grading, compacting soil, and installing a layer of gravel. Gravel used for the well pads would be purchased from local suppliers (which include several quarries within the project area). The typical layouts of a full- sized large diameter well is show in ***Error! Reference source not found.*****Error! ference source not found.**,.

Source: (Maurer Engineering Inc. 1998)

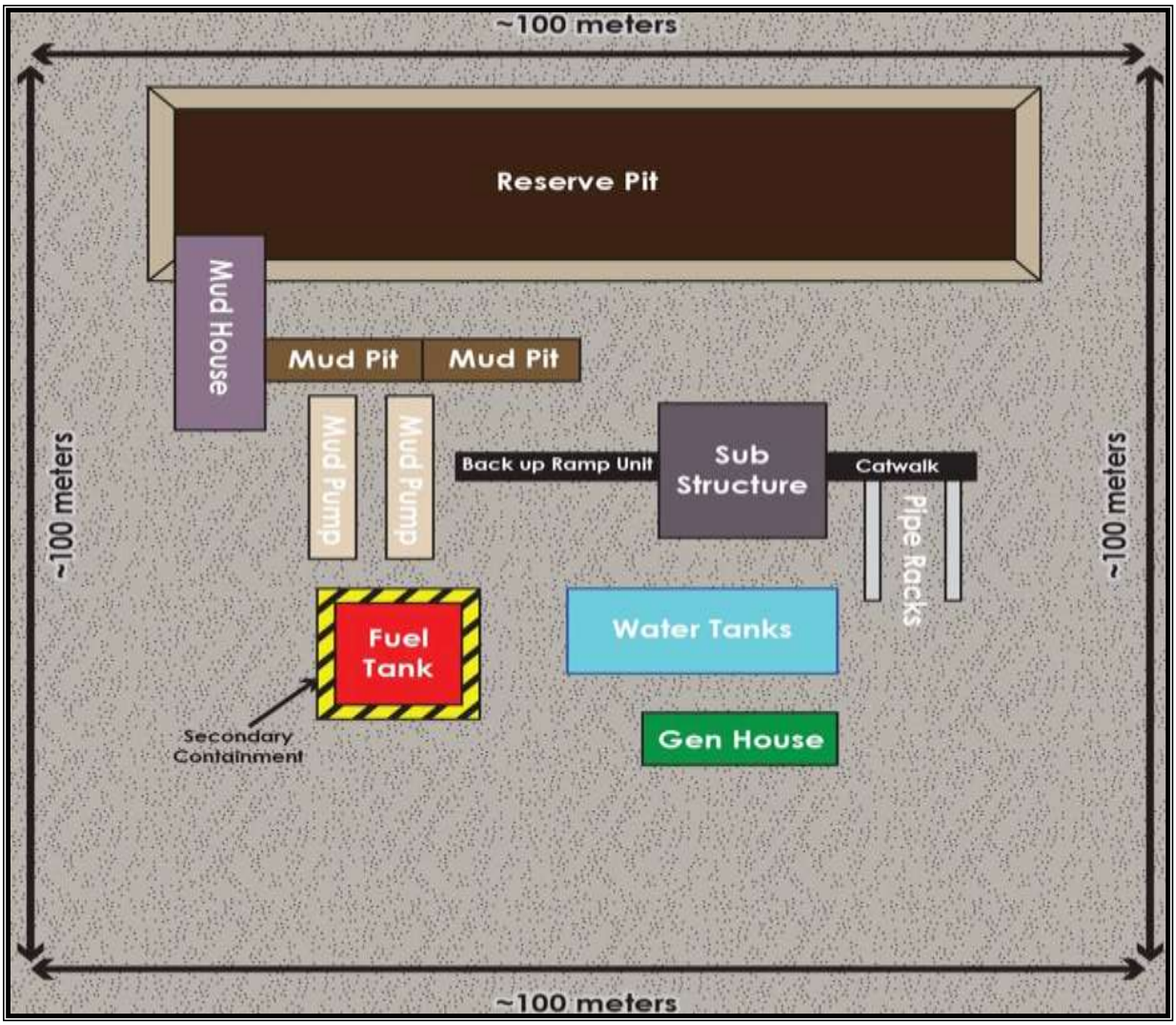


Figure 2-1: Typical Layout of a Full-Sized large diameter Well Pad (NOT TO SCALE)

Source: (Maurer Engineering Inc. 1998)

2.4 Well Drilling

As already described in the earlier sections, the proposed project includes drilling exploratory and appraisal wells at the potential drilling areas. The **Error! Reference source not found.** below lists some of the key arameters of full-sized large diameter wells

Error! Reference source not found. **: Potential *Drilling Operations for large diameter wells***

Component	Full-sized Large Diameter Wells
Well Pad Dimensions	100 x 100 meters (0.2 hectare) (330 x 330 feet; 0.5 acre)
Drill Rig Dimensions	20 x 10 meters (66 to 33 feet)
Minimum Access Road Width	6 to 7 meters (18 to 24 feet)
Well Diameter at Depth	7 inches
Target Depth	Varies, but could be estimated at between 2,000 to 3,000 meters (6,600 to 9,850 feet)

Estimated Water Demand during Drilling	Estimated at 20 to 30 liters per second (up to 90 days)
Drilling Materials	• Drilling mud/fluid • Casing • Cement
Drill Cuttings/Waste Storage	Lined sumps
Drilling Period	30 to 90 days (up to 24 hours per day)
Geothermal Resource Testing	Injectivity and production testing
Testing Period	Typically 30 to 90 days (if working up to 24 hours per day)

Sources: (GeothermEx and Power Engineers 2017)

The exploration wells are usually drilled using a combination of rotary and diamond coring drilling techniques. A diamond-coring rig that is equipped to rotary drill is the ideal rig type to complete these wells.

Drilling requires water to cool the drill and wash drill cuttings from the drill bit1. The final volumes required will be defined after selection of the drilling rig and hydraulics calculations are completed. Wells are drilled using water and non-toxic drilling mud. Variable concentrations of non- toxic additives (drilling fluid) are introduced to the drilling mud as needed to prevent corrosion, increase mud weight, and prevent mud loss. Additional drilling mud are mixed and added to the mud system as needed to maintain the required mud quantities.

All drill cuttings and drilling fluid would be discharged to a reserve pit or tank. After drill cuttings settle, the drilling fluid would be disposed of in a shallow well or open reserve pits. Drill cuttings would be left in the reserve pit if found to be non-toxic after testing. The final sump dimensions would be designed to handle all cuttings and mud that is not re-circulated.

An exploration well may need to be re-drilled or worked-over if problems occur that prevent completion of the well. Potential problems may include mechanical malfunctions, difficulty setting the casing, or limited permeability, productivity, or injectivity. The well may be re- drilled by re-entering and re-drilling the existing well bore, or moving the drill rig to a different location on the well pad and drilling a new well through a new conductor casing. Each well will be equipped with a well head and operating valve.

2.5 Geothermal Resource Testing

Testing for the presence or absence of an exploitable geothermal reservoir will be conducted after each well is completed. Depending on the final depth and characteristics of each well, these tests would include downhole temperature measurements, injection testing or production testing. Temperature-gradient measurements will be completed periodically for weeks after completion, after the drilling rig is off the location.

Wells that encounter elevated temperature and permeability at depth may be completed with a slotted liner.

If large diameter exploration wells are drilled and successfully encounter the geothermal reservoir, well and reservoir testing would be conducted to analyze characteristics of the resource. One or more initial short-

[1]*Drilling operations for the deeper sections of each well require relatively small amounts of water flow, whereas the larger hole diameters near surface require significantly more water flow for hole cleaning.*

term flow tests would occur at each exploration well, and one or more long- term flow tests will occur after the completion of all wells to assess the productivity of the geothermal reservoir and to sample the geothermal fluid. The well bore would ideally be cleared of all residual drilling mud and drill cuttings prior to conducting a well production test. Air may be injected to facilitate the well to flow. The geothermal fluids would be allowed to flow from the exploration well into an atmospheric separator, where temperature, pressure, flow rate, and chemical composition are monitored. The separated water would be discharged to tanks and steam would be released to the atmosphere through a silencer. The silencer may be a rock muffler or a larger diameter pipe. An injectivity test may also be performed by injecting the extracted geothermal fluid back into the exploration well. A long-term flow test may be performed, if warranted, to measure the flow temperature, pressure, and chemistry over time. The decision to conduct a long-term flow test will depend on wellbore conditions, benefits from the data obtained, and casing integrity.

2.6 Well Abandonment and Site Reclamation

The commercial potential of each exploration well would be assessed after testing. The well will not be abandoned if it is determined to have long-term use as a production well, monitoring well, or injection well. Equipment would be removed and the site cleared of excess material. The wellhead will remain in place for future testing, monitoring, or production.

If a well is not determined to have commercial potential, monitoring of the well may continue or the well may be abandoned. Well abandonment typically involves plugging the well bore with enough cement to ensure that fluid in the reservoir would not flow into different aquifers; the casing would remain in place. Any wellhead equipment would be removed from the well, and a metal cap would be welded to the casing.

The well pad sites would then be graded as necessary to restore the sites to the approximate original topography.

2.7 Water Demand and the Water Supply Line

The project would require fresh water for the workforce and to support well pad compaction and well drilling. Potable water would be obtained; hence the project has a proposed key pipelines to deliver the water to all the proposed project sites as shown in Figure 2-2.

- Water pipeline routes from the water boreholes to the resource area within the Menengai west geothermal project site shall be demarcated and vegetation cover cleared. However, in so doing, the report has recommended minimal vegetation destruction. The Report has also encouraged maximum use of road reserves (public lands) to minimise resettlement of people.
- Water pipelines shall be delivered to the site and laid from the water boreholes to the resource area within the Menengai west geothermal project site

Figure 2-3 below shows the project layout and the proposed routes for the water pipelines to each of the proposed project site.

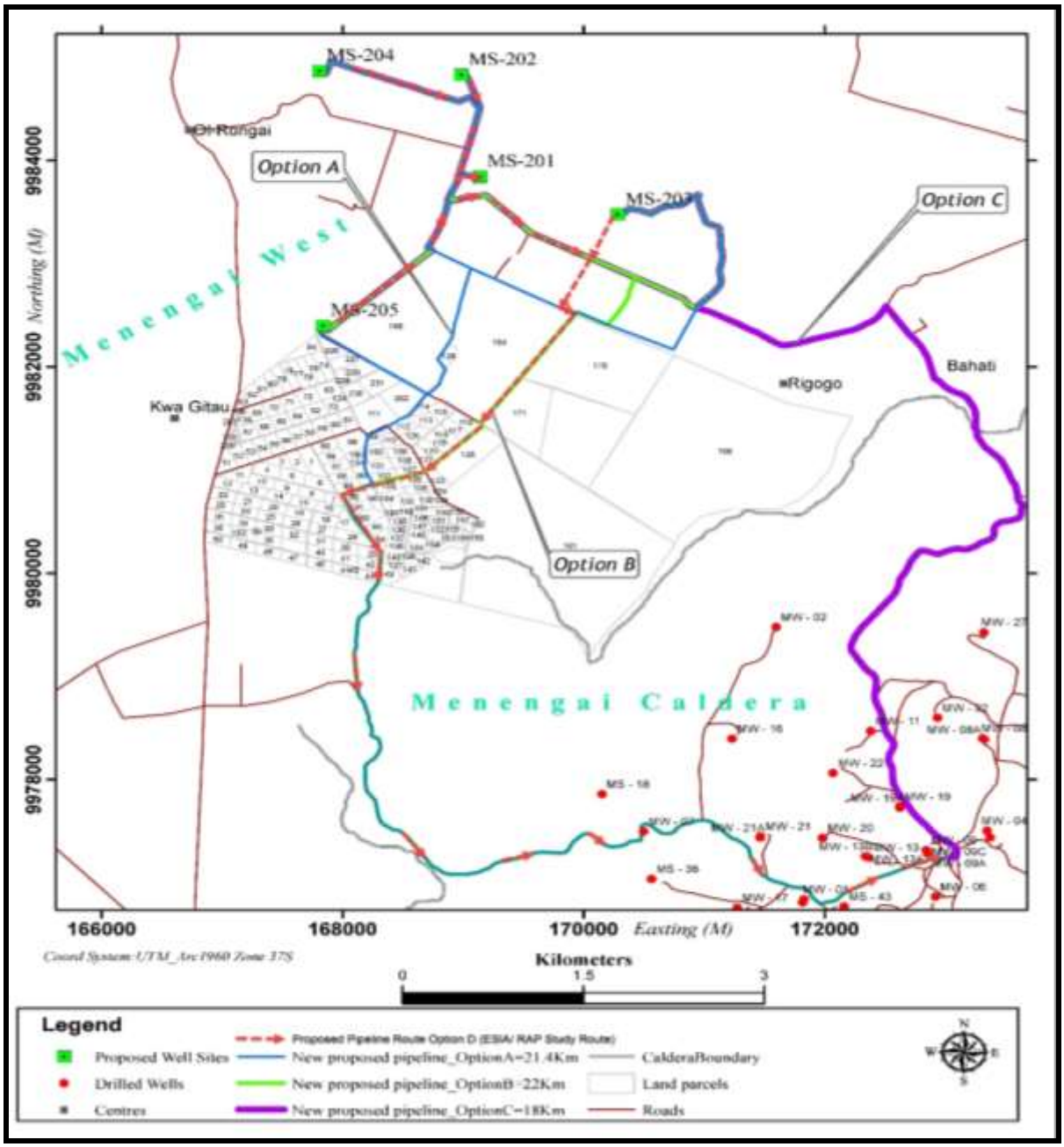


Figure 2-4: Project layout showing the proposed water supply routes to each of the proposed well site

2.8 Summary of Project-Related Land Acquisition Impacts

The Project itself will have limited impacts on affected areas; however, there is a need to acquire land for the exploration, construction activities, as well as pipeline wayleave and related infrastructure. Land acquisition process shall mainly affect drilling sites, where approximately 4.15 acres have been marked for each of the sites. Based on the proposed infrastructure map, substantial sections of the pipeline shall be placed along the road corridors, which is public land. Only few sections shall be acquired. This will make the acquisition process easier and will have a smaller impact on individual land owners.

It is however, anticipated that in the short and medium term, GDC will only apply to lease specific land parcels for exploration purposes. Negotiations for acquisition of land shall be dependent on the outcome of the exploratory work. The specific parcels to be affected are provided in Section 4.4.1.

3 LEGAL, POLICY AND REGULATORY FRAMEWORK

3.1 Introduction

This chapter presents a comprehensive review of the local and international laws, policies and regulations and relevant laws, relating to land acquisition and resettlement activities associated with the proposed exploratory geothermal wells drilling project in Menengai West Project area. These statutes that regulate the legal framework regarding land use and development of infrastructure displacement and compensation in Kenya and internationally are discussed below:

3.2 Constitution of Kenya

Article 60 of the constitution provides that land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable. Article 61 provides that all land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals.

The Bill of Rights under Article 40 limits the rights of the state in the deprivation of the right to own property or land anywhere within the country. Sub section (3) and (4) state in part:

(3) The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation—

(a) results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or

(b) is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that—

(i) requires prompt payment in full, of just compensation to the person; and
(ii) allows any person who has an interest in, or right over, that property a right of access to a court of law. Freedom of movement and residence. Protection of right to property

(4) Provision may be made for compensation to be paid to occupants in good faith of land acquired under clause (3) who may not hold title to the land.

Under Article 68, the constitution also provides for the converting of land from one category to another by the State. This provision enables the state to implement projects that are in the national interest.

3.2.1 The Lands Act 2012 (Revised 2016)

The Land Act of 2012 (Revised 2016) supports the constitution by providing for the sustainable administration and management of land and land-based resources.

The Act defines the forms of land tenure as freehold, leasehold, customary and easements; it recognises and enforces land rights arising under all tenure systems and non-discrimination in ownership and access to land under all tenure systems. Article 7 clause (c) provides for the compulsory acquisition of land for public good while Article (9) provides the process through which such acquisition shall be managed. The acquisition of land from the affected PAPs for the purpose of exploration must be in line with this Act.

The Act repealed The Way leaves Act, Cap 292 and The Land Acquisition Act (295) and amended a number of laws that previously provided legal framework for compulsory land acquisition for public infrastructure projects. Part VIII of The Land Act No. 6 of 2012 supplements the constitutional basis of compulsory land acquisition, setting the procedures and regulations that explain how the compulsory purchase power may be exercised for the purposes of "public interest".

A variety of bodies performing public functions can request that compulsory purchase powers be exercised on their behalf, including government ministries, county governments and parastatal organisations supplying necessary utilities. The relevant authority in the case of compulsory purchase is the Cabinet Secretary (at present the Minister of Lands) in charge of Lands and the executing office charged with the procedural issues is that of the National Land Commission (NLC). Every person having an interest or right in or over property which is compulsorily taken possession of or whose interest in or right over any property is compulsorily acquired has a right of direct access to the Land and Environment Court for the determination of his interest or right, the legality of the taking of possession or acquisition of the property, and the amount of any compensation to which he is entitled.

The proponent shall be expected to adhere to this law while obtaining land for the proposed project.

3.2.2 The Land Registration Act, Revised 2016 [2012}

This Act provides for the absolute proprietorship over land (exclusive rights). Under this act any person may acquire absolute ownership to any land once he or she has been registered as the absolute owner. On registration such a person acquires freehold interests on the land. Freehold implies absolute ownership. Any eventual acquisition and registration of land by the GDC should be in line with this Act.

3.2.3 The Land Adjudication Act ,2000 (Amended 2017)

The Act to provides for the adjudication of rights and interests in land and for purposes connected therewith or incidental thereto. Acquisition of land for the purposes of the geothermal exploration must follow the principle of this act.

3.2.4 The National Land Commission Act, Revised 2016 [2012}

This Act defines the functions and powers of the National Land Commission, qualifications and procedures for appointments to the Commission; to give effect to the objects and principles of devolved government in land management and administration, and for connected purposes.

The National Land Commission is tasked with establishing county land management boards for purposes of managing public land. Article 5 of the Act narrates the functions of the commission which include but not limited to: -

i). conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
ii). monitor and have oversight responsibilities over land use planning throughout the country

iii). monitor the registration of all rights and interests in land
iv). manage and administer all unregistered trust land and unregistered community land on behalf of the county government
v). develop and encourage alternative dispute resolution mechanisms in land dispute handling and management

The mandate of the National Land Commission extends to the determination of land rights and recording of interests in land particularly for development purposes for the benefit of the country.

3.2.5 The Environment and Land Court Act, 2011

This Act establishes a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.

The Environment and Land Court was established to hear and determine disputes relating to environment and land, including disputes:

i). relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources;
ii). relating to compulsory acquisition of land;
iii). relating to land administration and management;
iv). relating to public, private and community land and contracts, choses in action or other instruments granting any enforceable interests in land

The Act also provides, among other things, for the formulation of guiding principles that the Court must observe in exercise of its jurisdiction and alternative dispute resolution. Any dispute related to the acquisition of land and environment must be in line with the principles of this Act.

3.2.6 Energy Act 2006

This act consolidated the laws relating to energy, provide for the establishment, powers and functions of the energy regulation commission and the rural electrification authority; and for connection purposes. Section 54 of the act provides how land can be acquired if the minister in consultation will the energy commission is satisfied that the land is needed for public benefit. The acquisition of land from the affected PAPs for the purpose of geothermal exploration must observe the principle of this Act.

3.2.7 Valuers Act, 1985 (CAP 532)

The Valuers Act (CAP 532) is an Act of Parliament that provides for the registration of Valuers and offers to regulate the practise of valuation by establishing The Valuers Registration Board to oversee the operations of the discipline. Under this Act, the conditions and qualifications for registration as a Valuer are set out; the Act also details the circumstances under which the name of a Registered Valuer may be struck out of the register.

The Act expressly prohibits unregistered persons from practicing as Valuers; contravention of the Act is an offence punishable to a fine not exceeding ten thousand shillings or imprisonment for a term not exceeding twelve months or to both. Any persons involved in the valuation of the leasing of land for the purpose of exploration observe the requirement of this Act.

3.2.8 Valuation for Rating Act (CAP 266)

The Valuation for Rating Act empowers local government authorities to value land for the purpose of rates and for related purposes and applies to any area of a local authority in respect of which any rate on the valuation of land, other than a rate on the annual value of agricultural land, in the area has been imposed by or under any law.

The Act permits a Valuer appointed by the local authority to enter any property for the purposes of valuation and to enter the valuation details into a valuation roll; the valuation roll or any supplementary valuation roll contains:

i). the description, situation and area of the land valued;
ii). the name and address of the rateable owner;
iii). the value of the land;
iv). the value of the unimproved land;
v). the assessment for improvement rate

The value of land, according to Valuation for Rating Act CAP 266, is the sum which the freehold, free from encumbrances (including easements) might be expected to realize at the time of valuation if offered for sale on such reasonable terms and conditions as a bona fide seller might be expected to impose taking into consideration other land of similar class, character or position, and to other comparative factors, and to any restrictions imposed on the land, and on the use of the land. The valuation of the leasing of land from the affected PAPs for the purpose of geothermal exploration must observe the principle of this Act.

3.2.9 Rating Act (CAP 267)

This is an Act of Parliament that provides for the imposition of rates on land and buildings in Kenya. This Act allows local authorities to levy rates on properties to meet their expenses and to provide basic services such as water and sewerage within their areas of jurisdiction.

The Rating Act requires every rateable owner, joint registered owners and any person collecting rent from the piece of property to pay land rates and any interests accrued before the first day of January in the financial year.

This Act exempts from land rates the pieces of land exempted by the Valuation for Rating Act from valuation. The Valuation for Rating Act frees any land with encumbrances from valuation. For the purposes of this RAP, easements will be provided by the PAPs for their land acquired for the way leave and thus no land rates will apply for such portions. The rates applied for the proposed acquisition of rate for the purpose of geothermal exploration must be in line with the principles and requirement of this Act.

3.2.10 The Forests Conservation and Management Act, 2016

The Act gives effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes. The Act is important for this project where it may affect the Menengai forest. The relevant authorities will need to be kept informed of the impact on trees nearby this project. If the proposed acquired acquisition of land for exploratory wells and necessarily infrastructure development follows under the forest, the principle of this act must be observed to the later.

3.2.11 The Physical Planning Act, 2015

The Act provides for the preparation and implementation of physical development plans and for connected purposes enacted by the Parliament of Kenya. Any physical developement in the proposed acquired land for the purpose of geothermal expoloration must be in line with the requirement of this Act.

3.2.12 The Wayleaves Act, Cap 292

This Act provides for the acquisition and management of wayleave for pipelines, sewer, drains and others utilities. The Act lays down procedures and rights for access of such wayleaves by utility providers and the rights of citizens through whose property such wayleaves may pass. The proposed acquistion wayleaves for the purpose of accompanied infrastructure to the exploration of geothermal wells must observe the principles of this Act.

3.2.13 The County Governments Act, 2012

The creation of County Governments under the constitution of Kenya 2010 and the enactment of the County Governments Act transferred substantial levels of responsibilities to the counties. Under Schedule IV of the Constitution and Article (5) of the County Government Act, county governments are responsible for, among other duties, county planning, water supply, pollution control, transport and county public works and services. It is in this respect that the proposed project would require county government participation at planning and implementation. Any activities that follows within the County Government must adhere to the principles and regulations as stated under this Act. The exploration of the geothermal wells will fall under Nakuru County Government.

3.3 Vision 2030

Kenya's Development Agenda is anchored on the Kenya Vision 2030, which aims at creating "a globally competitive and prosperous country with a high quality of life by 2030". It aims to transform Kenya into "a newly –industrialized, middle-income country providing a high quality of life to all its citizens in a clean and secure environment". Simultaneously, the Vision aspires to meet the Millennium Development Goals (MDGs) for Kenyans by 2015.

The Vision is anchored on three key pillars: economic, social and political. The economic pillar aims to achieve an average economic growth rate of 10 per cent per annum by 2012 and sustaining the same till 2030 in order to generate more resources to meet the MDGs and Vision 2030 goals. The social pillar seeks

to achieve a just, cohesive and equitable social development in a clean and secure environment, while the political pillar aims for a democratic, issue-based, people-centred, result-oriented and accountable system

The growth in economy translates into changes in energy demand. Meeting this energy demand would involve refocusing the economy to address certain socio-political aspects of the economy which includes increase in energy distribution. This process must start with exploration activities, such as the ones proposed by GDC in Menengai West.

3.4 International Policies for International Institutions

3.4.1 World Bank Environmental and Social Framework

Applicants seeking financing from the World Bank are required to comply with the applicable bank environmental and social standards.

The World Bank developed an Environmental and Social Framework document that includes ten Environmental and Social Standards (ESSs). The ESSs support the World Bank's OPs and associated environmental and social safeguards, and identify the requirements for borrowers regarding the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing (World Bank 2017.). The Environmental and Social Framework are applicable for all bank supported investments from 1 October 2018.

Summary of the key objectives of relevant ESSs are provided below:

- **ESS1: Assessment and Management of Environmental and Social Risks and Impacts.** ESS1 applies to all projects for which Bank Investment Project Financing is sought. ESS1 establishes the importance of: (a) the Borrower's existing environmental and social framework in addressing the risks and impacts of the project; (b) an integrated environmental and social assessment to identify the risks and impacts of a project; (c) effective community engagement through disclosure of project-related information, consultation and effective feedback; and (d) management of environmental and social risks and impacts by the Borrower throughout the project life cycle. The Bank requires that all environmental and social risks and impacts of the project be addressed as part of the environmental and social assessment conducted in accordance with ESS1. ESS1 applies to the proposed project and will have to be complied to throughout the project life cycle.

- **ESS2: Labor and Working Conditions.** ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. This report recognises the importance of compliance with labour laws and international worker's rights at all stages during project development, operation and decommissioning.

- **ESS3: Resource Efficiency and Pollution Prevention and Management.** ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume

finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle. Efficient energy use through adoption of energy-saving systems and the avoidance of pollution as much as is practically possible will be key during the implementation of the proposed project in compliance with ESS3.

- **ESS4: Community Health and Safety.** ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable. ESS4 applies to the proposed project.

- **ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.** Involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented. The LACP has been developed in compliance to ESS5.

- **ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.** ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources, and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, who access to, or use of, biodiversity of living natural resources may be affected by a project. This standard applies to the Menengai West Geothermal Development Project.

- **ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities**, Ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. The project area under the Olkaria West Geothermal Project has no indigenous people nor does it have underserved traditional local communities and therefore ESS7 does not apply to the proposed project.

- **ESS8: Cultural Heritage.** ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present, and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle. The scope to which the proposed project may affect cultural heritage has been described in the main ESIA repor.

- **ESS9: Financial Intermediaries (FIs)**. ESS9 recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI. The complexity of the proposed project means that there may be FIs at some point within the project life. When this occurs, such FIs will be required to comply with SS9.

- **ESS10: Stakeholder Engagement and Information Disclosure.** ESS10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. A Stakeholder Engagement Plan (SEP) has been prepared as part of the ESIA and in compliance with ESS10.

3.4.2 International Finance Corporation's (IFC) Environmental and Social Performance Standards

The International Finance Corporation's (IFC) Environmental and Social Performance Standards define IFC clients' responsibilities for managing their environmental and social risks. The 2012 edition of IFC's Sustainability Framework includes Performance Standards (PSs).

The PSs that may be relevant to the project are described below.

- **IFC PS1 – Social and Environmental Assessment and Management System.** PS1 requires that an Environmental and Social Management System (ESMS) be implemented throughout the life of the project. An effective ESMS identifies and evaluates environmental and social risks and impacts of the project, and defines a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.

- **IFC PS2 – Labor and Working Conditions.** PS2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. PS2 is in part guided by international conventions and instruments, including the International Labour Organization and the United Nations. It recognizes that the client adopt and implement human resources policies and procedures.

- **IFC PS3 – Pollution Prevention and Abatement.** PS3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and

consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices.

- **IFC PS4 – Community Health, Safety and Security.** PS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. This Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project-related activities, with particular attention to vulnerable groups.

- **IFC PS5 – Land Acquisition and Involuntary Resettlement.** PS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. It requires that the client consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, and when it cannot be avoided, the client will offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods.

- **IFC PS6 – Biodiversity Conservation and Sustainable Natural Resources Management.** PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented.

- **IFC PS8 – Cultural Heritage.** PS8 recognizes the importance of cultural heritage for current and future generations. In addition to complying with applicable law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage, the client will identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented.

2.2.3 2016 World Bank Environmental and Social Standards Framework

The World Bank developed an Environmental and Social Framework document that includes ten Environmental and Social Standards (ESSs). The ESSs support the World Bank's OPs and associated environmental and social safeguards, and identify the requirements for Borrowers regarding the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing (World Bank 2017. The Environmental and Social Framework, adopted in 2018, applies to all new Bank investments. The ESIA is intended to satisfy

the relevant requirements set forth in the Environmental and Social Framework and ESSs for future investment opportunities and to follow the World Bank's most recent guidance.

A summary of the key objectives of relevant ESSs are provided below:

- **ESS1: Assessment and Management of Environmental and Social Risks and Impacts.** ESS1 applies to all projects for which Bank Investment Project Financing is sought. ESS1 establishes the importance of: (a) the Borrower's existing environmental and social framework in addressing the risks and impacts of the project; (b) an integrated environmental and social assessment to identify the risks and impacts of a project; (c) effective community engagement through disclosure of project-related information, consultation and effective feedback; and (d) management of environmental and social risks and impacts by the Borrower throughout the project life cycle. The Bank requires that all environmental and social risks and impacts of the project be addressed as part of the environmental and social assessment conducted in accordance with ESS1.

- **ESS2: Labor and Working Conditions.** ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.

- **ESS3: Resource Efficiency and Pollution Prevention and Management.** ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle.

- **ESS4: Community Health and Safety.** ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.

- **ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.** Involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.

- **ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.** ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they

support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources, and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, who access to, or use of, biodiversity of living natural resources may be affected by a project.

- **ESS8: Cultural Heritage.** ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present, and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle.

- **ESS10: Stakeholder Engagement and Information Disclosure.** ESS10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

3.4.3 Environmental, Health, and Safety Guidelines

i. General Guidelines

The World Bank's General Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of the environmental assessment. The General EHS Guidelines cover the following topics: Environmental, Occupational Health and Safety, Community Health and Safety, and Construction and Decommissioning.

ii. Geothermal Power Generation Guidelines

The World Bank's *Environmental, Health, and Safety Guidelines for Geothermal Power Generation* provides specific recommendations for management of EHS issues associate with geothermal power generation (IFC and World Bank Group 2007b) The guidelines were designed to be used in tandem with *Environmental, Health, and Safety General Guidelines*, which provides guidance on common EHS issues for all industry sectors. Although this project does not include power generation, the guidelines provide recommendations for management of drillings fluids and cuttings, air emissions (i.e., H2S), solid waste, well blowouts and pipeline failures, and water consumption and extraction. The guidelines also specify worker protection requirements for confined spaces, heat, noise, and infrastructure safety.

3.4.4 African Development Bank Environmental and Social Assessment Procedure Revised 2015 [approved 2001].

The Bank has Integrated Environmental and Social Impact Assessment Guidelines and Environmental and Social Assessment Procedures (ESAP). It details the specific procedures that the Bank and its borrowers or clients should follow to ensure that Bank operations meet the requirements of the operational safeguards

(OSs) at each stage of the Bank's project cycle. The guidelines integrate environmental and social concerns into the life cycle of a project and also stipulate requirements for specific projects. Built upon the previous safeguard policies on the Involuntary Resettlement Policy (1995), the Policy on Indigenous Peoples (1998) and the Environment Policy (2002), the Safeguard Policy Statement was approved in 2009. The safeguard policies are operational policies that seek to avoid, minimize or mitigate adverse environmental and social impacts including protecting the rights of those likely to be affected or marginalized by the developmental process. ADB's safeguard policy framework consists of three operational policies on the environment, indigenous peoples and involuntary resettlement.

1. **Environmental Safeguard**

This safeguard is meant to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision making process.

2. **Involuntary Resettlement Safeguard**

This safeguard has been placed in order to avoid involuntary resettlement whenever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre- project levels; and to improve the standards of living of the displaced poor and other vulnerable groups.

3. **Indigenous Peoples Safeguard**

This safeguard looks at designing and implementing projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems and cultural uniqueness as defined by the Indigenous Peoples themselves so that they receive culturally appropriate social and economic benefits; do not suffer adverse impacts as a result of projects; and participate actively in projects that affect them. Under the ESAP, the Borrower is responsible for integrating environmental and social considerations sponsored projects according to the Bank's requirements.

3.5 International Laws and Guidelines/ /Multilateral Environmental Agreements

In addition, Kenya is also a signatory to a number of international treaties and conventions hence bound to international guidelines that govern the development of geothermal resources. Those that are relevant to the proposed Menengai West geothermal drilling project include:

The International Guidelines relevant to the project that have include:

3.5.1 IFC Environmental, Health, and Safety Guidelines for Geothermal Power Generation

These guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues. 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.

Applicable provisions of the IFC's General Environmental, Health and Safety Guidelines, including the following:

1. Environment

- Section 1.1 Air Emissions and Ambient Air Quality
- Section 1.3 Wastewater and Ambient Water Quality
- Section 1.6 Waste Management
- Section 1.7 Noise

2. Occupational Health and Safety

- Section 2.1 General Facility Design and Operation
- Section 2.2 Communication and Training
- Section 2.3 Physical Hazards
- Section 2.4 Chemical Hazards
- Section 2.7 Personal Protective Equipment
- Section 2.9 Monitoring

3. Community Health and Safety

- Section 3.1 Water Quality and Availability
- Section 3.2 Structural Safety of Project Infrastructure
- Section 3.4 Traffic Safety
- Section 3.7 Emergency Preparedness and Response

4. Construction and Decommissioning

- Section 4.1 Environment
- Section 4.2 Occupational Health and Safety
- Section 4.3 Community Health and Safety

3.5.2 IFC-IGA Geothermal Exploration Best practices

The practices cover the preliminary survey, as well as the geological, geophysical, and geochemical surveys and provide guidance on the survey tools to use for different types of geothermal systems. By following such best practices, developers can reduce early stage project risk by more accurately locating and characterizing geothermal resources prior to drilling.

3.5.3 IFC's Environmental, Health and Safety Guidelines for Hazardous Materials

These guidelines are designed to be used together with the relevant Sector EHS Guidelines for hazardous material. 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.

3.5.4 Ramsar Convention on Wetlands

This is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is

the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet. Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements, but it works very closely with the other MEAs and is a full partner among the "biodiversity-related cluster" of treaties and agreements.

The study did not encounter any wetland within the project area. However, the ESMP would mitigate indirect effect to the wetland by managing emission and controlling runoffs.

3.5.5 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. The objective of the 1992 UNFCCC is to tackle the negative effects of climate change.

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.

The Conventions' stated aim is to stabilize greenhouse gas concentrations at a level that allows ecosystems to adapt naturally to climate change so that food production is not threatened, while enabling economic development to proceed in a sustainable manner (article 2). Kenya signed the UNFCCC on 12 July 1992, ratified it on 30 August 1994 and started enforcing it on 28th November 1994.

Geothermal energy is considered green energy and will contribute to less greenhouse gases. In addition, GDC and the contractors will be required to observe the above convention in all its operations throughout the project cycle in reducing emission of Greenhouse Gasses leading to climate change.

3.5.6 Convention on Biological Diversity

In response to the growing threat posed by human activity to biodiversity and inspired by the world community's growing commitment to sustainable development, during the 1992 Earth Summit in Rio de Janeiro world leaders adopted the Convention on Biological Diversity (CBD). It is the most important Convention dealing with biodiversity conservation.

The Convention has three main objectives:

- To conserve biological diversity
- To use biological diversity in a sustainable way
- To share the benefits of biological diversity fairly and equitably.

IUCN has been involved in the CBD since its drafting and through its further development. Its policy work has helped to ensure that decisions taken by the Parties to the Convention are as effective as possible to achieve the CBD objectives.

3.5.7 Paris Agreement on Climate Change of 12th December 2016

On 12 December 2015, 196 Parties to the UN Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement, a new legally-binding framework for an internationally coordinated effort to tackle climate change. The Agreement represents the culmination of six years of international climate change negotiations under the auspices of the UNFCCC, and was reached under intense international pressure to avoid a repeat failure of the Copenhagen conference in 2009.

The Paris Agreement recognizes the different starting points and responsibilities of countries.

The Paris Agreement builds on the Climate Change Convention and – for the first time – unites all nations in an ambitious effort to combat climate change and adapt to its effects, with enhanced support for developing countries to do so. As such, it charts a new course in the global climate effort.

As already mentioned, Kenya's escalated investment geothermal energy is considered big step towards increased use of green energy, which will contribute to less greenhouse gases. GDC and the contractors will be required to observe these conventions in all its operations throughout the project cycle.

3.5.8 Convention on conservation of Migratory species of Wild Animals (Lake Nakuru and Rift Valley)

This convention was signed in Bonn in June 1979, and entered into force on November 1, 1983. It covers the protection of migratory species and their habitats and is the only global convention established exclusively for the conservation and management of migratory species. It is also concerned with wild animals that migrate across or outside national jurisdictional boundary.

The project area is situated close to Nakuru Park, and Soysambu Conservancy. This Convention should therefore be considered in the course of the project, and where applicable, best practices should be followed on the safe and appropriate handling of migratory species of wild animals.

4 LACP PROCESS

4.1 Overview of Process

The proposed land acquisition and livelihood restoration measures described in this document was undertaken in accordance with national and international requirements. This section describes the process of LAC implementation.

i) Identification of Project impacts and affected people involving:

- Mapping of the Project area and affected households/land plots including the class of land, owners and land use patterns, private and communal land, businesses and assets
- Census of affected plots, assets and persons to establish a list of people with formal and informal land rights and livelihoods and to identify those who will be eligible for compensation and/or assistance
- Socio-economic survey to complement the census data and gather information on the socio-economic background of affected people and evaluate the impacts on their livelihoods. This also helps to identify any vulnerable individuals or groups who may need additional assistance.
- Inventory of affected assets, properties and structures based on mapping and census work that, which will be used to monitor LAC activities.
- Public consultation meetings to provide information on the Project, scheduling, land acquisition, LAC procedures, peoples' rights and the process for establishing entitlements, compensation and livelihood restoration measures.

ii) Entitlements matrix and compensation framework based on the information from the above steps, an entitlements matrix has been established.

iii) Valuation of land and compensation including structures, buildings, crops, interrupted economic activities and lost access to natural resources and compensation offers has been conducted. However, the valuation of assets does not take account of asset depreciation. Crops have been factored in for budgetary purposes in case the project is implemented before harvests. Whilst the approach aims to achieve appropriate compensation levels, in cases where affected people reject compensation offers, appeal and legal procedures in line with national legislation can be initiated.

iv) Payment of compensation made by GDC prior to land acquisition or lost access to economic activities and natural resources.

v) Livelihood restoration assistance might be needed for certain land owners and users, although the nature of land acquisition, i.e. acquiring a smaller portion for the pipeline wayleave makes it unlikely that livelihood will be adversely affected by the Project.

vi) In addition, the overall LAC process also involve the following elements:

- Continued public consultation and information disclosure
- Establishment of a Grievance mechanism

- Monitoring and Evaluation of LAC implementation

This LACP is a framework that sets out the principles of wayleave acquisition for the proposed water pipelines as well as the proposed drilling sites. Depending on when the project implementation takes effect, there might be need for a further update of the same.

4.2 Census of Affected People and Assets

A detailed census of all affected people, households, plots, properties and other assets is necessary to identify the number of affected people and plots. The census was undertaken by the consultant between 29 October 2018 and 15 November 2018. The socio-economic survey was also conducted and provided detailed information on formal and informal livelihoods, assets, activities and structures within the project area. All affected people regardless of having formal title who were recorded during the census will be eligible for compensation in accordance with best practices.

4.3 Socio-economic survey

A socio-economic survey was undertaken to identify:

- Details of PAPs
- Patterns of land use, crop cultivation and use of natural resources
- Livelihood and income levels of APs, especially income from lost land for both formal and informal land users
- Vulnerable people who require additional attention in order to equally benefit from the Project among other information

This project will affect persons mainly from two Sub-counties: Subukia and Rongai sub-counties, in Nakuru County, as shown in Fig 4-1.

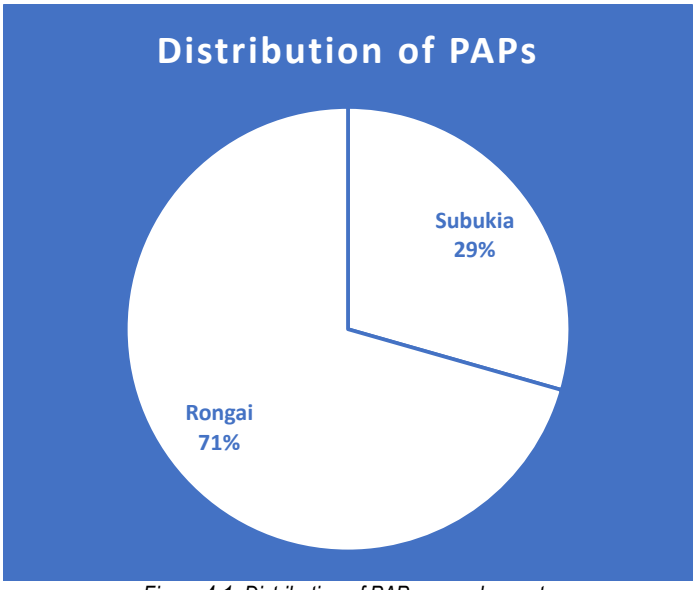


Figure 4-1: Distribution of PAPs per sub county

4.3.1 Sex and Age Distribution of the PAPs

The distribution of members of the PAPs based on sex and age is presented in fig 4-2:

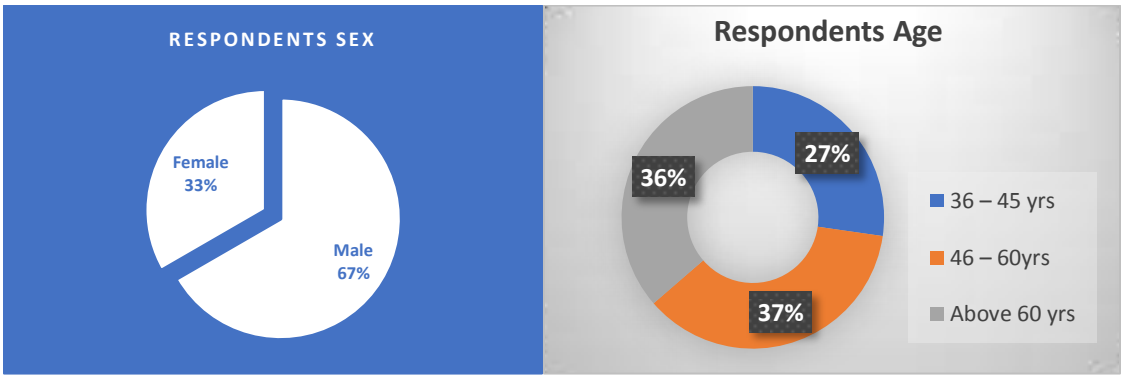


Figure 4-2: Sex and age distribution of the respondents

The results indicate that 37 per cent of the respondents are aged between 46 – 60 years, while 27 per cent of are aged between 36 – 45 years. The results also reveal that 36 per cent of the PAPs are aged above 60 years. This group is considered vulnerable, as members of such group require special assistance to restore their income and/or livelihood status if affected.

4.3.2 Education and Literacy

Survey findings indicated that 37 per cent of the respondents had attained basic primary education, 36 per cent had attained secondary education, 9 per cent have studied up to the post-secondary level and that 9 per cent never attended school. Survey findings on the education levels of the PAPs are presented in the figure 4-3:

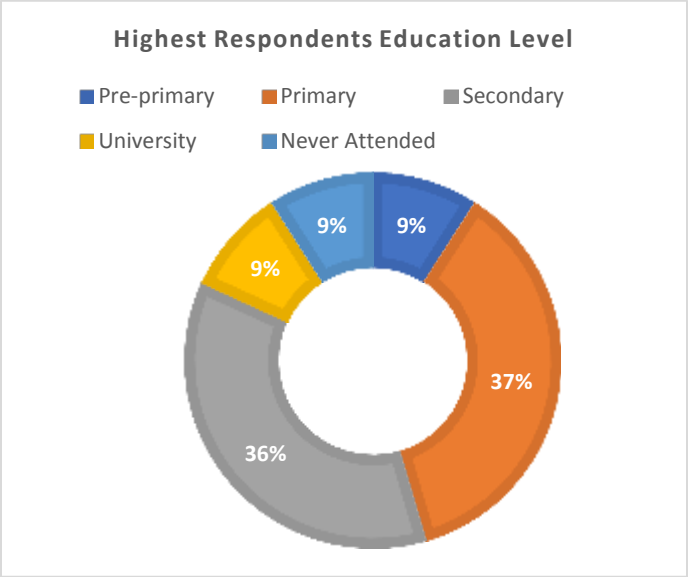


Figure 4-3: Education levels of the respondents

4.3.3 Sources of Water

Water is one of the biggest challenges facing the PAPs (Fig 4-4). Even though this is problem facing the wider Nakuru County, the PAPs problem has been exacerbated by the terrain and the fact that they are on higher grounds, which making the cost of pumping very expensive.

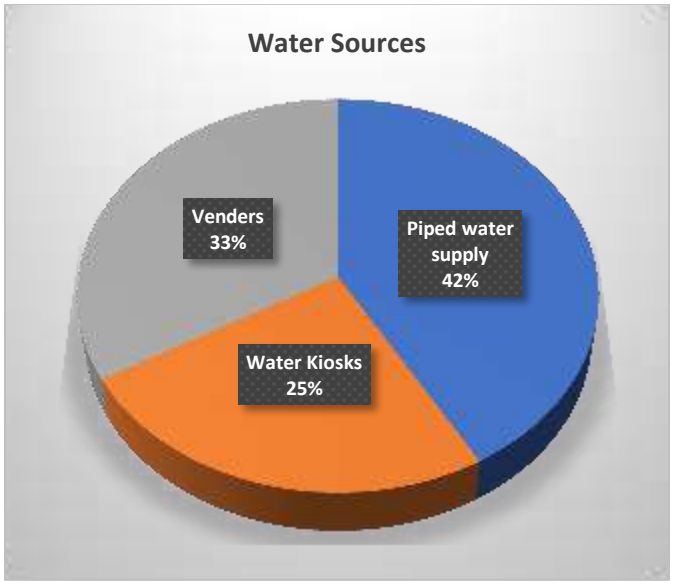


Figure 4-4: sources of water for residents in the project area

4.3.4 Vulnerable PAPs

Vulnerable people in the project area include children, the elderly, the sick, female-headed households and the physically challenged persons. These categories of PAPs require assistance and protection to help them overcome difficulties during the implementation.

As discussed in section 4.3.1, the survey revealed that 36 per cent of the PAPs are aged above 60 years; this group is considered vulnerable, as members of such group require special assistance to restore their income and/or livelihood status.

The survey examined the presence of any physical, sensory, mental or other impairment, including visual, hearing or physical impairment which has substantial long-term adverse effect on a person's ability to carry out usual day to day activities. From the survey 3 respondents of the PAPs households reported they had physically challenged persons living within their homes. These disabilities were all related to hearing.

4.3.5 Economic and Livelihood Activities

The survey revealed that crop farming accounted for 93 per cent of the total household income (Figure 4-5). Other income sources included casual employment, business and formal employment.

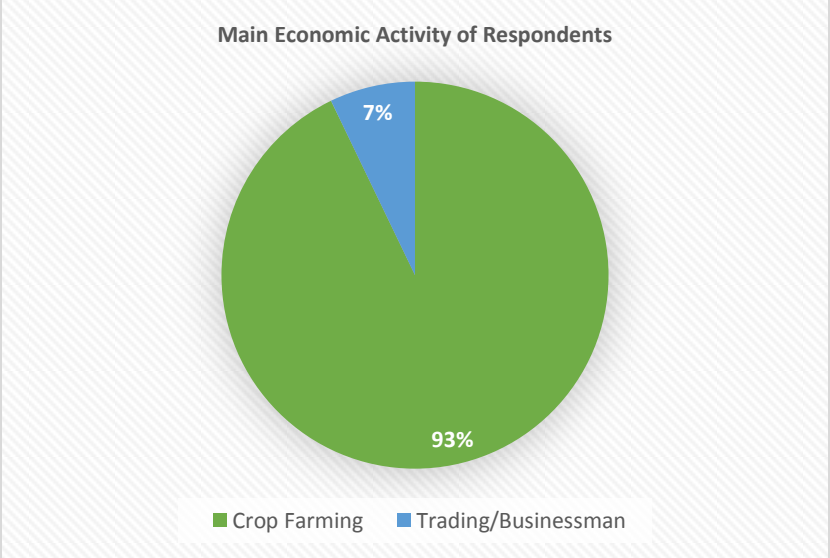


Figure 4-5: Main Economic activity of PAPs

For those that practice crop farming, 78% percent grow maize crop, both for subsistence and as cash crop. The yields per acre widely varied and has been presented in the Figure 4-6:

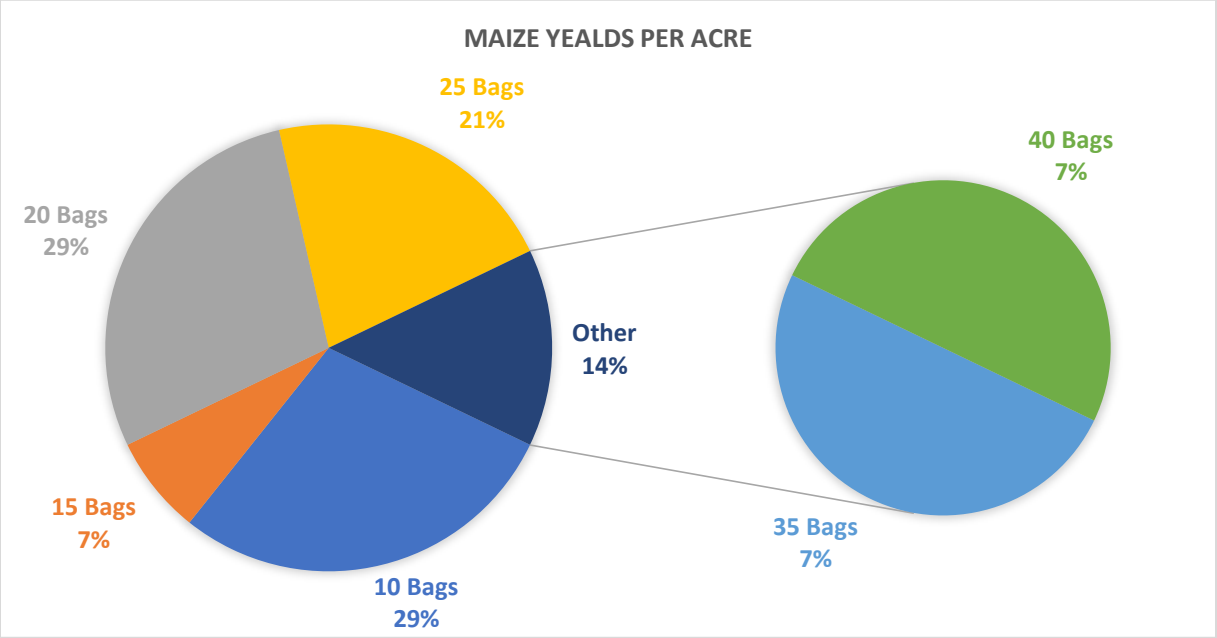


Figure 4-6: Economic & Livelihood activities

4.3.6 Property Ownership

Properties are critical to the life of a human being; structures provide for shelter and storage, land provides the ideal space for constructing the structures and for setting-up socioeconomic activities while trees provide food, construction materials and shade. This survey indicated that 78 per cent of the respondents had their land falling within the proposed project area. Majority did not have any structures within these areas. However, farmlands may be affected. (Figure 4-7)

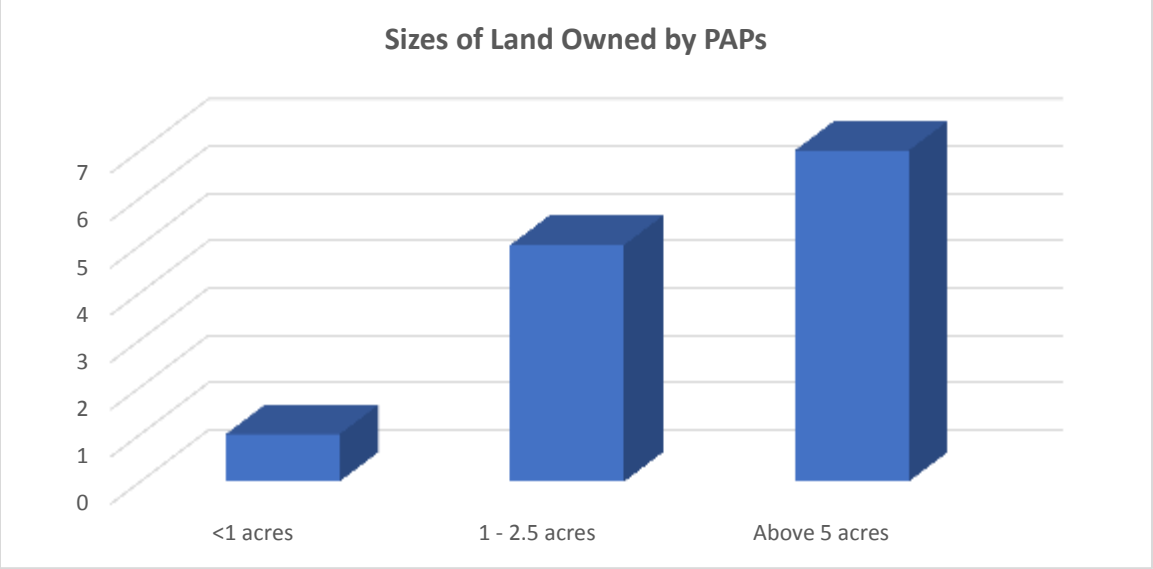


Figure 4-7: Sizes of Land owned by Project Affected Persons

Land is an important asset for the PAPs as most of them depend on crop farming as a source of income. The survey findings indicate that all the affected persons have proof of ownership, either title deeds, allotment letters, tenancy agreements or sale agreements.

Information on the affected household ability to relocate if necessary was collected; all the affected household were willing to relocate within their plots provided that they were fairly compensated. When asked how they acquired the lands, especially in the project-affected areas, majority (85%) said they bought. Others got the properties through inheritance (Figure 4-8).

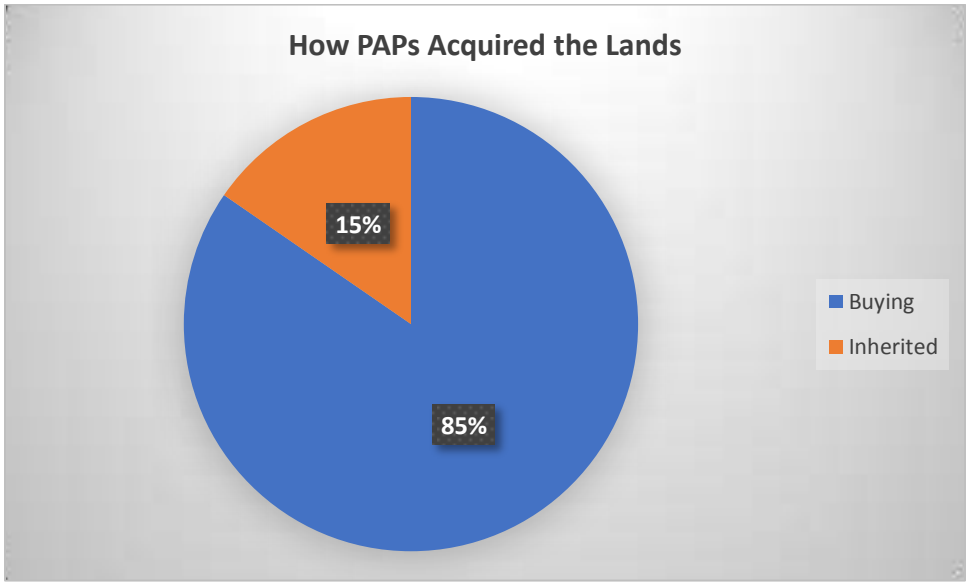


Figure 4-8: How PAPs acquired the lands

PAPs were also asked whether their land holding was under any form of disputes or caveats, the majority indicated that no disputes or caveats existed while 2 cases were cited that disputes existed. The two cases are being adjudicated in court.

4.3.7 Accessibility of Social Structures

The survey revealed that 28 per cent of the PAPs said primary school was the closest public facility to them, 36 per cent could access a road, and 36 per cent could access health facility (Figure 4-9). Water point and secondary school were farthest from the project areas.

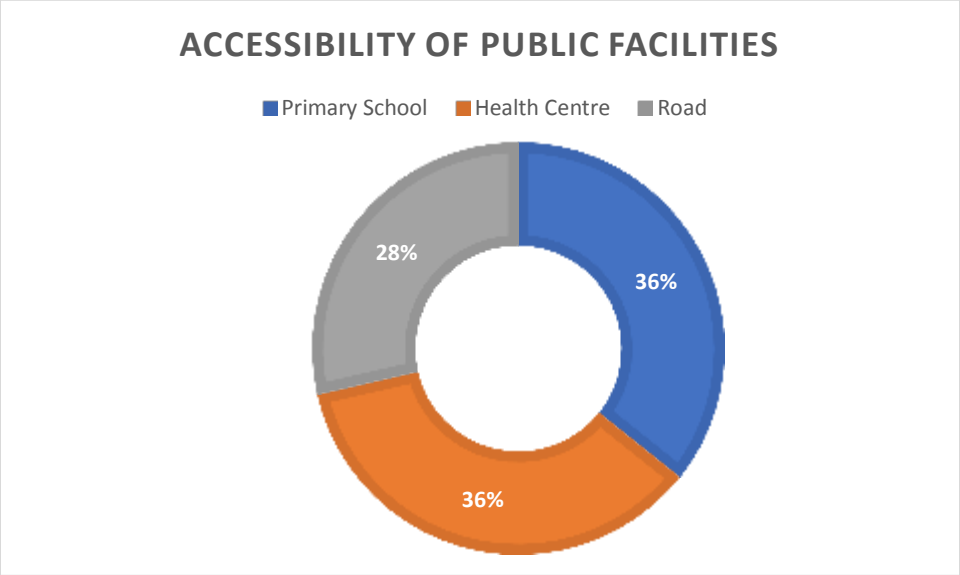


Figure 4-9: Accessibility of Public Facilities

4.4 Entitlements Matrix

Table 4-1: Entitlement Matrix

Type of Loss	*Specification*	*Entitled Person*	*Category*	*Compensation Entitlements*
Land	✓Private land	✓Owners	✓Land Parcel of over 5 acres	✓Provide 100% compensation at open market value on land lease rate (KES.150,000 per acre/per year)
			✓All other categories of land	✓Provide per centum rate of 30% of the open Market Value of the affected land.
Building and Structures	✓Modern houses with modern finishes including concrete, natural stone, bricks and treated sawn timber materials structures	✓Owners	✓Permanent	✓Provide compensation rate within range of KES 1,500 – 3000 per square feet depending on finishes used
	✓Structures made from sawn timber, timber-off cuts, GCI walling, sundried bricks or cemented floors	✓Owners	✓Semi-permanent	✓Provide compensation rates of within range of KES 1000-2500 per square feet depending on finishes used
	✓Thatch roofs, rammed or earthen floors and Adobe blocks and wattle, thatch walls, tents, tarpaulins and manyattas	✓Owners	✓Temporary Houses	✓Provide compensation rate within range of KES 500-1500 per square feet depending on finishes used
Domestic Storage Facilities	✓Based on the permanency, design, size and construction materials used.	✓Owners	✓Storage facilities	✓Rates will be between KES 500 -1,500 per square foot
Domestic animal units	✓Chicken pens, zero grazing units and other domesticated animal facilities.	✓Owners	✓Animal facilities	✓Rates will be between KES 500 - 1,000 per square foot
Fencing	✓These will be determined by type of construction material, (chain links, barbed wire, concrete	✓Owners		✓Chain link from KES 400 – 600 per metre run, barbed wire from KES 100 – 300 per metre run, concrete/stone wall from KES700 –1,000 per metre run, natural hedge is catered for under crop damage. The variance will be determined by type of the supports
Crops	✓Crops damaged as a result of the acquisition way leaves and construction activities.	✓Owners	✓All crops	✓Crop damage compensation rates will be at market rates
Trees	✓All trees taller than 12 feet	✓Owners	✓Private or Public	✓For trees, compensation rates will be derived at Market rate (KES 8,000 for mature trees and KES 5,000 for small tress)
Economic loss	✓Business premises affected acquisition way leaves and construction activities.	✓Owners	✓All	✓Provide one-time payment

In conducting the census, the following was considered for various components of the project:

1) For all the exploration sites, the proposed land parcel of 4.15 acres was considered (i.e. 120m by 140m). This is considered adequate for all the site components, which include exploration rig, stores, ponds, dumping site, among others.
2) For the pipeline, the design attempted to minimize displacement, and restricted the layouts to existing roads, proposed roads (as captured in the survey maps, registry index maps, RIM). Transect walk along the proposed pipeline established that majority of roads had minimum of 9m wayleave. This was considered adequate to lay the proposed lines.
3) However, there are sections that have been proposed for re-routing the pipeline. This could shorten the pipeline by up to 70% for the specific section. However, the wayleave in the said section is about 6m. It is possible that GDC can restrict its proposed pipeline within the available 6m wayleave. However, in the event that the Company decides to expand the wayleave additional 3m, the consultant captured the details of PAPs likely to be affected. Details of the landowners were captured in case this option is explored. This is shown in Figure 4.8.
4) A few parts of the pipeline layout pass through private property. In these sections, mainly mature trees will be affected. In most cases, the owners could not be reached, as some were said to be out of the country. The information has however been captured and the details of landowners being sought

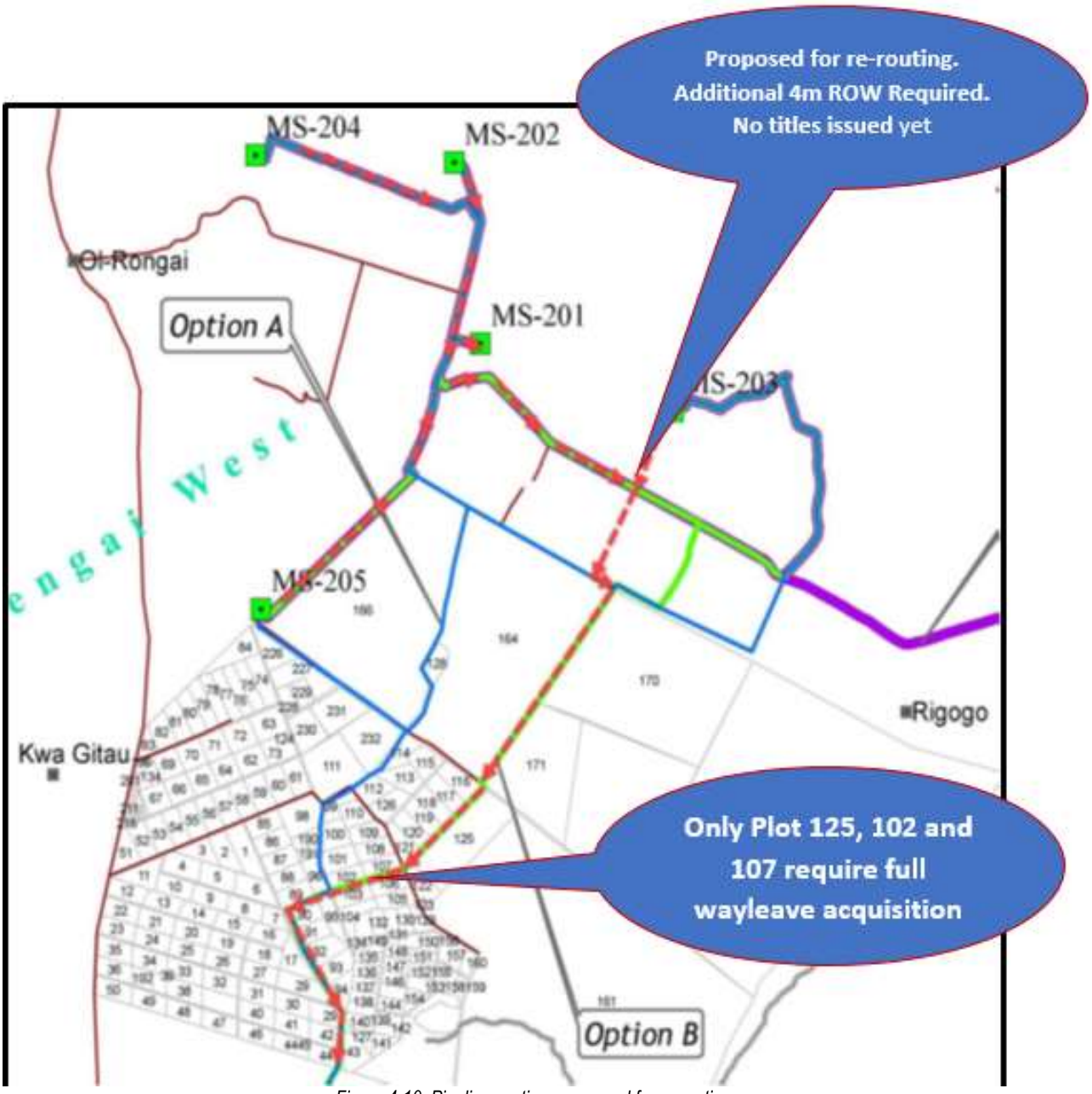
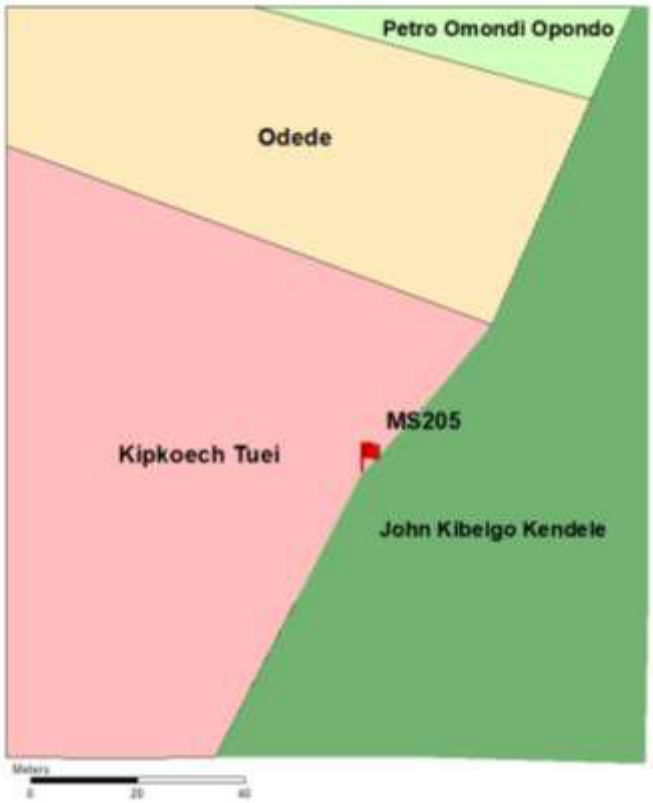


Figure 4-10: Pipeline sections proposed for re-routing

4.4.1 PAPs and shapes of land affected for drilling sites

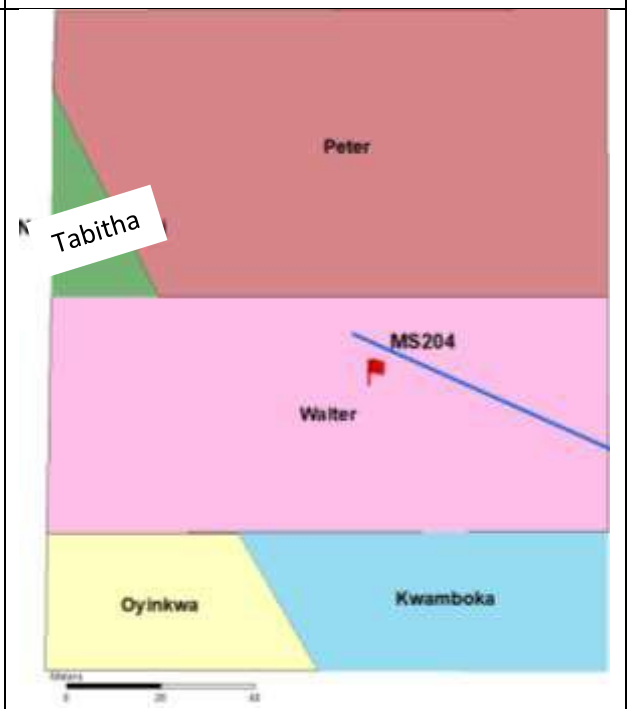
MS205: Four PAPs affected. No Structures affected



MS201: One PAP Affected. No Structure affected

MS202: 3 PAPs affected. One structure affected

MS 204: Five PAPs affected. One structure affected



MS203: One PAP affected, one structure also affeted.

4.5 Valuation

This section provides the frame work used for computation of compensation to the PAPs identified within the 5 proposed geothermal Well Sites and way-leave trace for the drilling water pipeline network. Generally, valuation is done on full replacement cost and fair market value basis. Items to be compensated within proposed geothermal wells sites and the way-leave trace for the drilling water pipeline network are land, structures, trees and crops.

This framework is based on Kenyan laws, but also taking into consideration the AfDB, IFC and World Bank policies.

4.5.1 Valuation Procedure and Methodology

Legal Procedure: The procedure followed in this report are based on legal procedure outlined in the Valuers Act Cap 532, which requires that a duly authorised valuer be engaged in making cost valuation of assets to be possessed by any development project. Other statutes governing valuation and adopted in this report include the Land Act, 2012 and Land Registration Act, 2016. We also took cognisance of the AfDB and World Bank involuntary resettlement policies.

4.5.2 Valuation Methodology

In arriving at our opinion of value, we have considered the two generally accepted approaches to values; namely:

i. **Cost Approach** – considers the cost to reproduce or replace in new condition the assets appraised in accordance with current market prices for similar assets, with allowance for accrued depreciation arising from condition, utility, age, wear and tear, or obsolescence present, taking into consideration past and present maintenance policy and rebuilding history.

   Physical depreciation is the loss in value due to physical deterioration resulting from wear and tear in operation and exposure to elements. Deterioration due to age and deterioration due to usage are the main factors that affect physical condition. Physical condition due to wear and tear is proportional to use rather than age. Use is the best indicator to estimate physical deterioration

ii. **Market Data or Comparative Sales Approach** – considers prices recently paid for similar assets, with adjustments made to the indicated market prices to reflect condition and utility of the appraised assets relative to the market comparative. Asset for which there is an established second-hand market comparable is best appraised by this approach.

A. Compensation for Land:

The cost of land is based on the ***open market prices***. The acreage affected was then multiplied by the ***open market prices*** for land to yield an estimate of total cost of the land to be affected within the drilling wells and along the way leave trace for the pipeline.

The proposed exploration sites land size parcel considered was 4.15 acres (US) (i.e. 120m by 140m) per drilling site. This is considered adequate for all the exploration components, which include drilling sites, stores, ponds, dumping site etc. The wayleaves of 9 metres width was also considered. An average market leasing rate value of **KSh. 150,000** per acre per year of land in the project area was considered.

The total compensation leasing cost of the affected land was computed and found to be **KSh**. **17,486,160.00 for 5-year** leasing period.

B. Valuation and Compensation of Structures

In valuing structures and other buildings, we used an estimate of the total effort invested in terms of building materials (floor, wall, roof type, finish and labour input) which we valued at market rates without factoring in depreciation. Based on the condition of the structure (poor, fair and good); consultations with property owners and contractors within locality; expert judgement and property comparison, we valued and allocated full ***replacement cost new*** for each of the affected property. The outcome was used to derive the value of target property/ structures and other buildings.

The replacement cost principle and applying the market rates was used to derive the total compensation cost for all the affected structures of ***15 per cent disturbance allowance according to world bank guidelines.*** *The total compensation value for structures was computed to* ***KSh 1,191,033.84****.* The details of all the affected structures are provided as Volume III of this Report.

C. Disturbance Allowance

The law requires that a 15 percent disturbance allowance be paid in addition to compensation value on the affected assets/properties. From the assessments, document reviews and consultations, it was established that the rate should suffice to cater for disturbance. The rate of 15 per cent is also provided for in the Laws of Kenya. Guided by these facts, it is recommended that a 15% disturbance allowance be paid in addition to the compensation value of the affected assets/properties.

We further recommend that the community members be enlightened further on legal restrictions that govern the process.

D. Summary of Compensation Costs

The PAPs will need to be compensated in accordance with the GDC LAC policy. For activities involving loss of land, loss of access to land or restriction of access to resources, provisions will be made for compensation and for other assistance required for relocation prior to displacement. Where applicable, this assistance may include the provision and preparation of host resettlement sites with similar facilities available or made available as existed nearby the affected area/plot.

Provisions for compensation include the following activities: disclosure on the general principles of compensation to the various districts affected communities where initial feedback will be received as to the general compensation principles as outlined in the RPF; this will be followed by PAP individual compensation option/ package(s) disclosure meetings whereby Letters of Offer (Offer Agreement) will be provided to PAPs for review and initial feedback. As to acceptance of the various option/ packages being offered and assistance to be provided; a date will be arranged for signing the Letters of Offer with each of the PAPs and where cash compensation has been agreed a cheque for 70% of the value will be furnished.

The Letters of Offer will provide details of the individual compensation amounts for land, structures and crops including disturbance allowance and uplift where appropriate and the additional support that will be provided by GDC or designate depending upon the criteria of the PAP and the package agreed. Where cash is the main compensation package agreed a 90 days' notice of access is issued to these PAPs during which time the PAP depending upon the PAP categorization and compensation package paid must have vacated the way leave trace/plot, removing all structures/material etc so that access for clearance and construction can commence.

Those PAPs who need assistance or opt for land for land package access to their land and assets may be only gained after compensation has been promptly paid and resettlement sites and relocation assistance has been provided to the PAPs. GDC will provide to each PAP 70% of their allotted cash payment upfront to enable the PAP to make the necessary arrangements for relocating structures and/or vacating the plot. The final 30% of compensation will be paid once confirmed that the PAP has vacated the land and/or removed or relocated all structures.

4.6 Eligibility, Cut-Off Date and Entitlements

4.6.1 Eligibility

This LACP will be implemented in line with the Laws of Kenya. Eligibility of affected land must be confirmed by legal documents of ownership (squatters may own structures but are not considered land owners)

4.6.2 Cut-Off Date

The date of census establishes the cut-off date to record the PAPs in the project area who can receive compensation for loss of assets and/or resettlement and rehabilitation assistance, the establishment of the Cut-Off Date is required to prevent opportunistic invasion of the proposed project sites. Census and inventory of lost assets was completed on 15 November 2018, which effectively became the cut-off-date, i.e the last day of socio-economic survey and inventorization of PAPs.

4.6.3 Entitlements

Entitlement matrix defines categories of affected people, type of loss associated with the project and types of compensation and/or assistance to which each category is entitled.

4.7 Livelihood Restoration

It is proposed that all PAPs should be compensated to ensure that their livelihoods have improved or restored to the pre-impact status. The main livelihood losses will include crops, trees, business and commercial properties among others. In addition to adequate compensation of assets, we propose that the following income and livelihood restoration be considered as well:

- Employment of affected persons at construction
- Capital support for income generation activities
- Enhanced market linkage
- Provision of relocation assistance

Training on skill development and capacity building on areas such as enterprise, job creation, agriculture, community participation and management, health and hygiene education.

5 INSTITUTIONAL ARRANGEMENTS

5.1 Introduction

A successful implementation of the plan depends majorly on the institutional and organisational arrangements made for its implementation. The implementation of the LACP rests with GDC and specifically, their LACP Project Team. The LACP Project Team will implement this plan in consultation with the PAPs, PDPs, Key stakeholders, County Administration and the local administration. The collaboration from all the above through a properly constituted structure will lead to transparency in the implementation.

5.2 Organisation Structure

5.2.1 LACP Project Team

A specific LACP Team for this project will be established by GDC to manage the RAP process and will comprise of a socio-economist, surveyor, way leave officer, environmental specialist, geothermal expert, land valuer, legal officer and building technician. The Roles and responsibilities of the LACP Team will include but not limited to:

i. Public sensitization of all stakeholders and on-going community engagement;
ii. Socio-economic survey to identify the PAPs;
iii. Establish eligibility for compensation;
iv. Valuation of loss of use of assets i.e. land, structures and crops/trees;
v. Determination of compensation for loss of employment/incomes and loss of business;
vi. Offer compensation options – including cash and resettlement alternatives;
vii. Deliver prompt compensation/resettlement;
viii. Provide assistance to vulnerable PAPs;
ix. Be a member of the grievance procedure; and
x. Monitoring, evaluation and reporting.

5.2.2 LAC Working Group (LACWG)

This LACP will be implemented in partnership with all relevant key stakeholders not limited to governmental, non-governmental and community organisations. A LACWG will act as the primary channel of communication between these various interest groups/organizations involved in the resettlement process. The LACP Project Team will where necessary task a dedicated LACWG to address all concerns and grievances which may occur. The LACWG will comprise the local leaders and PAP (community) representatives. The roles and responsibilities of the LSCWG will include but not limited to:

i. Act as the primary channel of communication between the various interest groups/organizations involved in the land acquisition and compensation process;

ii. Serve as communication link between GDC and the PAPs; and
iii. Serve as the court of first appeal to solve problems that may arise during LACP's implementation.

5.2.3 Local LACP PAP Committees of Project Committee (PC)

The committee shall be the local level representation of PAPs in the locations or sub-locations and will act as a voice for the PAPs. During the public consultation meetings, the members expressed their desire to have a transparent and an all-inclusive compensation process. The committee shall comprise of the following:

i. Chairman – a PAP, appointed or elected by area PAPs
ii. Secretary – a PAP, appointed or elected by area PAPs
iii. 2 members nominated by the PAPs (Gender to be considered)
iv. Village elder(s)/ community elder(s)/ as would be appointed/elected/deemed necessary by area PAPs
v. Local area Assistant County Commissioner, Chief or Assistant Chief.
vi. Ward Administrator

The establishment of the committee will be based on the magnitude, length and the number of Sub-Counties impacted by the proposed project.

6 DISCLOSURE OF INFORMATION, PARTICIPATION AND CONSULTATION

6.1 Introduction

Public consultation is vital tool for a successful implementation of a project. It has to be incorporated in the LACP to achieve firsthand information on the suggestions and opinions that the public may have concerning compensation, resettlement, impact assessment and any other emerging issues specific to the area. Furthermore, their consent and participation makes the exercise efficient and fast.

6.2 Objectives

The main objective of public consultations is to provide an avenue for the Consultant to educate the public on the project as well receive their opinions, concerns and reservations on the same. The public and other stakeholders need to be involved from an early stage to ensure that their needs and suggestions are identified and met.

Specific objectives of the consultations are to:

i). Introduce the public and other stakeholders to the project
ii). Identify the opinions, concerns and suggestions that the stakeholders have in relation to the project

6.3 Key Issues Arising from Public Participation Meetings

We held consultative meetings with community members along the project areas between, the last meeting being held on the 9th November 2018. The meetings were well attended, both genders and age groups being fairly represented. PAPs were informed prior to the meetings so as to avail themselves in time and this assisted in having a large turnout.

The main purpose of the meetings were to re-introduce the project to the PAPs and the community at large and receive their feedback on how it will impact on them. Most issues that were raised were common and the following is a list of key issues that were brought up:

- Safety of land occupants near the project sites
- Clarification on specific project activities
- Employment- they suggested that the youth and other skilled professionals to be given employed under the project
- Issues of compensation
- Corporate social responsibilities

7 GRIEVANCE REDRESS MECHANISM

7.1 Introduction

Grievance redress mechanisms are procedures put in place to allow people to lodge a complaint without cost and with assurance of a timely and satisfactory resolution of that complaint. They are essential tools for allowing affected people to voice their concerns regarding resettlement and compensation process as they arise and, if necessary, for corrective action to be taken in a timely manner. Such mechanisms are fundamental to achieving transparency in the resettlement process. Timely redress of such grievance is vital to the satisfactory implementation of resettlement and the completion of the project in schedule.

7.2 Potential Resettlement Grievances

Potential grievances and disputes that may arise in the course of implementation of the LAC may be related to the following:

i. Project implementation.
ii. Valuation process; crop rates, option packages offered and prohibitions
iii. Disagreements on compensation values;
iv. Disagreements on eligibility criteria,
v. Inventory mistakes;
vi. Mistakes related to identification and disagreements on boundaries between the PAPs;
vii. Divorces, successors and the family issues resulting into ownership disputes;
viii. Disputed ownership of a given asset; and
ix. Community planning measures.

7.3 Proposed Grievance Management and Redress Mechanism

The above-mentioned grievances may occur during implementation of LACP. These grievances should be resolved using the internal GDC grievance redress mechanism.

The following are steps for grievance redress as stipulated in borrowed from the standard World Bank RPF:

i. **First Order Mechanism**: First order mechanism involves registration of the grievances with the Land Acquisition and Compensation Working Group (LACWG). The LACWG will then seek to eliminate nuisance claims and satisfy legitimate claimants by attempting to reconcile the aggrieved PAP(s) and GDC.

ii. **Second Order Mechanism**: Where the complaint and grievance cannot be resolved by the LACWG, the complained is referred to the Tribunal of Public Complaints Committee (PCC).

iii. **Third Order Mechanism**: In instances where the Public Complaints Committee is unable to resolve the matter, the same will be referred to the Courts for settlement. Kenyan citizens and legal entities have access to court recourse in conformance with applicable laws. The aggrieved PAP(s) have the right to pursue the matter up to the Supreme Court if necessary.

iv. **Fourth Order Mechanism**: Expropriation of land will be used as a last resort when all of the above procedures have either failed or extensive delays to the project are foreseen. Expropriation means taking away of private land and landed property for public purpose by the Government with or without the owner's consent subject to laws of eminent domain, which stipulates prompt and adequate compensation among other things.

8 LACP IMPLEMENTATION, BUDGET, MONITORING AND REPORTING

8.1 Introduction

The objective of monitoring and evaluation is to provide the proponent with feedback and to identify problems and successes as early as possible to allow timely adjustment to implementation arrangements. It serves to report on the effectiveness of the implementation of the LAC, covering physical resettlement, disbursement of compensation and effectiveness of public consultation, amongst others. Monitoring and evaluation activities should be integrated into the overall project management process and the LAC must provide a coherent monitoring plan that identifies the organizational responsibilities, methodology, and the schedule for monitoring and reporting.

8.2 Monitoring and Evaluation

8.2.1 Internal Monitoring

Internal Monitoring by GDC should be done in line with stipulated company monitoring procedure. This will check that physical progress has been made in execution of required actions. Progress reports will be produced on a monthly basis, or as deemed necessary. This monitoring will be conducted by a suitably qualified person(s) within GDC.

Periodic evaluations will be made in order to determine whether the PAPs have been compensated in full in accordance with this RPF and associated procedures and before implementation of the project activities; and whether the PAPs enjoy the same or higher standard of living than before. GDC will also develop a project specific schedule of monitoring for the project and the duration of when monitoring will be carried out.

8.2.2 External Monitoring and Evaluation

This report recommends that in cases where the capacity for monitoring and evaluation will be inadequate within the company, an external monitoring and evaluation team may be recruited.

External monitoring will serve the purposes of compliance monitoring and impact evaluation. The overall objective of external monitoring will be to:

i. Review the results of internal monitoring and review overall compliance of LACP
ii. Assess whether relocation objectives have been met especially with regard to housing, living standards, and compensation levels among other parameters
iii. Assess general efficiency, sustainability and effectiveness of relocation and formulate lessons for future resettlement activities.

8.3 Monitoring Indicators

Indicators are important and useful tools for monitoring and evaluating progress. Indicators are information management tools, useful for assessing the progress achieved at a certain point in the project cycle, as well as for monitoring and collecting information regarding the project and its beneficiaries.

They are quantitative or qualitative factors or variables that provide indicate project implementation status, when progress is not being achieved, in which case corrective measures can be implemented. We have attached the monitoring indicators for the LACP in Appendix 1, which will be used to evaluate the achievement of this plan.

8.4 Implementation

8.4.1 Community Consultation

Resettlement or compensating PAPs needs effective communication or dialogue with the stakeholders. This exercise should continue until implementation of LAC is complete. The consultant undertook an extensive consultation with the PAPs.

GDC personnel should continue to conduct a series of consultation and counseling meetings with the PAPs. During these meetings, the PAPs should be informed of the results of the study findings and plans for the area including actual date of implementation. These consultative meetings should include all other stakeholders.

8.4.2 Implementation Timelines

The implementation times will be pegged on the following process

- RPT is constituted
- Liaison with PC

- RPT signs off on the LACP. This constitutes GDC acceptance of the terms of the LACP
- Formation of LACWG
- GDC draws up offer documents for affected people and advertises the fact that offers will be made.
- The affected people review the offers made and enter into agreements with GDC.

8.5 Implementation Budget.

The Proponent will require an implementation budget of KSh. 23,706,286.00 as outlined in the table 8.1 below.

Table 8.1: ***Implementation budget estimates***

Item Compensation	***Estimated Quantity***	***Budget Estimates (KES)***[2]
Compensation for Easement over Land (Acres) for 5 Years	**23.31488**	17,486,160
Compensation for Affected Structures[3] (No.)	**5**	1,191,033.84
Compensation for Trees/Crops/Fruit Trees	183 trees, 14 bags of maize	768,000
Economic Rehabilitation Cost	N/A	845,601.576
Sub-Total (ST1)		***20,290,795.42***
Technical Assistance		630,186.74
Monitoring and Evaluation[4]		630,186.74
Sub-Total (ST2)		***1,260,373.483***
Total (ST1+ST2)		***21,551,169.00***
Contingency (10%)		2,155,117
Grand Total		***23,706,286.00***

[2] *Leasing Rate of Ksh.150,000 Per Acre of Land*
[3] *Inclusive of 15% disturbance allowance provided on buildings and structures only*
[4] Includes the formation of Local PAP Committees

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The subject of this LACP Report is the proposed drilling of exploratory wells located along the Ol'Rongai Hills located on the western side of the Menengai Caldera.

This LACP has been prepared consistent with the applicable policy provisions of Kenyan Government and the provisions of the World Bank's Safeguard Policy on Involuntary Resettlement (OP 4.12). OP 4.12 requires that a RAP be prepared for all projects that anticipate land acquisition and displacement affecting shelter, livelihood and associated impacts. Basically, this LACP presents an inventory of (register) of people likely to be affected by development of the proposed project, a register of the assets that are likely to be displaced by the project and the proposed compensation package.

The drilling of wells and pipeline infrastructure project would lead to acquisition of land and resettlement of those whose structures are overhead traversed or lie within the well drilling proposed area.

9.2 Recommendations

1. **Consultations:** Project affected persons should be consulted continuously about the resettlement plan and implementation of the same prior to commencement of construction activities. Particular attention should be given to vulnerable groups such as the elderly, female headed households, the sick, the orphans and the internally displaced persons.
2. **LACP Budget:** The proponent should set aside a budget of **KSh 23,706,286.00 (Inclusive of 10% contingency)** for the implementation of LACP
3. **Compensation:** The compensation package provided in this report is based on market rates. We recommend that compensations should be made before commencement of the proposed project through the proponent office. A minimum of three (3) months' notice should be given to the PAPs to enable them salvage all their assets. In case cash compensation would not be the preferred option, the proponent should consider other methods of compensation such as *structure for structure*. In the case of absentee landowners or compensation under dispute, GDC should set aside sufficient funds in an escrow account or similar financial instrument to cover unpaid compensation.
4. **Monitoring and Evaluation:** Monitoring and evaluation should be a continuous process. GDC will be responsible for all aspects of internal monitoring. In case of capacity challenge, an external consultant, if deemed appropriate, knowledgeable in resettlement matters should be appointed to carry out external monitoring and evaluation.

5. **Community Expectations:** The PAPs raised issues especial on water supply and access to good road for the attention of the project proponent. These issues should be taken into considerations, especially when designing the water pipeline.
6. **Disturbance Allowance:** Add a sum equal to 15% of the market value by way of compensation as disturbance and enlighten the community members on the legal restrictions that govern the process.

7. **Unenumerated PAPs:** We recognize that there are absentee PAPs who were not reached due to time constraint and also distance. As such there might be some incomplete information in our census. We therefore recommend that any person who was not enumerated but can show documentation or evidence that he/she is rightfully entitled should also be considered for compensation.

10 APPENDICES

Appendix 1: Monitoring Indicators

Subject	Indicator	Variable
Land	Relocated PAPs / PDPs	• Area of cultivation land acquired for GDC • developments • Area of communal land acquired for GDC • developments • Area of private land acquired. • Area of government land acquired.
Buildings/ Structures	Number of buildings to be demolished	• Number, type and size of private buildings acquired • Number, type and size of community buildings acquired • Number, type and size of government buildings acquired
	Number of other structures to be demolished	• Number, type and size of other private structures acquired • Number, type and size of other community structures acquired
Trees and Crops	Number of trees to be cleared	• Number and type of trees cut • Age size at girth level
	Value of crops to be destroyed	• Crops destroyed by area, type and ownership
Compensation, Re-establishment and Rehabilitation	Number of PAPs compensate d	• Number of households affected (buildings, land, trees, crops) • Number of owners compensated by type of loss • Amount compensated by type and owner • Number of replacement houses constructed • Size, construction, durability and environmental suitability of replacement houses • Possession of latrines • Water supply access • Number of replacement businesses constructed
	Number of community resources re- established	• Number of community buildings replaced • Number, type of plants lost • Number of seedlings supplied by type • Number of trees planted
Hazards and Disturbances	Number of complaints received from PAPs	• Number of households affected by hazards and disturbances from construction (noise levels, blasting, increased traffic levels)
Social/ Demographic	Changes to household structure	• Household size (births, deaths, migration in and out) • Age distribution • Gender distribution • Marital status • Relationship to household head • Status of vulnerable households
	Population migration	• Residential status of household members • Movement in and out of the household (place and residence of household members)
	Changes to access	• Distance/travel time to nearest school, health Centre, church, shop, village

	Changes to health status	• Nutritional status of resettled household members • Number of people with disease, by type (sexually transmitted diseases, diarrhea, malaria) • Mortality rates • Access to health care services (distance to nearest facility, cost of services, quality of services) • Utilization of health care services • Disease prevention strategies • Extent of educational programmes • Latrine provision at schools (school child population per latrine on site)
	Changes to educational status	• Literacy and educational attainment of household members • School attendance rates (age, gender) • Number, type of educational establishments
	Changes to status of women	• Participation in training programmes • Use of credit facilities • Landholding status • Participation in GDC related activities and enterprises

Appendix 2: Summary of PAPs sheets

S/No.	Name of Household Head	Household Head ID Number	Household Head Contact (Phone No.)	Gender	Age Bracket	Sublocation	Location	Vulnerability	Affected Land size (Acres)	Cost of Land Per Acre (Ksh.150,000*)	Affected Structures	Trees/ Crops
1	John Kibeigo Kendele	931363	721426173	M	Above 60	Ol rongai	Menengai	yes	1.4	1050000	0	25000
2	Kipkoech Tue	5985656	713286859	M	Above 60	Ol rongai	Menenagi	yes	1.62	1215000	0	50000
3	Walter Mukanzi	2168874	720310574	M	36 -45	Ol rongai	Menengai	none	1.46	1095000	0	8000
4	samuel Kinyanjui Wainana	5155623	721654443	M	46-60	Ol rongai	Menengai		1.42	1065000	0	0
5	Tabitha Nyamboke	13329989	729557982	F	36 -45	Menengai	Menengai	none	0.12	90000	183,203.28	10000
6	James K Mwangi	4442506	722833413	M	Above 60	Menengai	Menengai	Yes	1.27	952500	0	64000
7	Suleiman Kipronoh	25299310	726483794	M	36 - 45	Kerima	Solai	none	4.13	3097500	267,377.76	40000
8	Petro Omondi Opondo	106772927	724104960	M	46 - 60	Menengai	Ol Rongai	none	0.15	112500	0	0
9	Teresa Kwamboka		740755638	F					0.51	382500	594,172.80	42000
10	Karanja Kibuku		722247710	M					4.13	3097500	0	175000
11	David Rop		721334375	M					1.43	1072500	0	0
12	Odede		726402975	M					0.99	742500	0	0
13	Peter			M					1.64	1230000	0	0
14	Oyikwa		752296952	M					0.35	262500	0	0
1	**Additional PAP for Pipeline Wayleave**											
2	Prof. Henry Kiptanui			M					0.5893	441975	0	0
3	Kaltundo Farm (Hon. Gideon Moi)			M					0.8006	600450	0	0
4	Nehemiah Bunet			M					0.4648	348600	144,210	600000
5	David Cheruiot			M					0.511	383250	0	0
6	Maina Kamau			M					0.04	30000	0	20000
7	Maina			M					0.0371	27825	0	20000
8	Isaac Thuo		715429649	M					0.08599	64492.5	0	0
9	Harrison Maina			M					0.09118	68385	0	0
10	Susan Wacheria Njenga		728470478	F	46-60	Kirima	Solai		0.03781	28357.5	2,070.00	10000
11	Grace Njeri Ndirangu		711407983	F	over 60	kerima	Solai	yes	0.0371	27825	0	10000
	Total								23.31488	17486160	1191033.84	1074000

* Leasing Rate (Ksh) Per Acre Per Year

5 Year Leasing Period considered

Appendix 3: Valuation of Structure Sheet

1	NAME OF PROPERTY OWNE	PHONE CONTACT	PLOT NO.	ID NO.		GPS-coordinate						
	Susan Wachera Njenga	728470478		4690053		562656	9564613					
	NO:1	DESCRIPTION			NATURE	AREA M²	AREA FT²	RATE	REPLACEMENT COST	DISTURBANCE ALLOWANCE	TOTAL COMPENSATION	PHOTO
		Fence **Wooden Fence**			TEMPORARY	3	32.292	600.00	1,800.00	270.00	2,070.00	
		OVERAL TOTAL COMPENSATION									2,070.00	
			PLOT NO.	ID NO.		GPS-coordinate						
2	Teresa Kwamboka	0740755638-Brother (Stephen)				167809	9984870					
	NO:1	DESCRIPTION			NATURE	AREA M²	AREA FT²	RATE	REPLACEMENT COST	DISTURBANCE ALLOWANCE	TOTAL COMPENSATION	PHOTO
	1	Main House **Foundation:** Earth **Floor:** Earth **Walls:** Mud **Doors:** Wooden **Window:** Wooden **Roof:** Double pitched with Wooden Trus, Iron sheet			TEMPORARY	40	430.56	1,200.00	516,672.00	77,500.80	594,172.80	
		OVERAL TOTAL COMPENSATION									594,172.80	
3	NAME OF PROPERTY OWNE	PHONE CONTACT	PLOT NO./I	ID NO.		GPS-coordinate						
	Tabitha Nyamboke		MS 204	13329989		167809	9984870					
	NO: 1	DESCRIPTION			NATURE	AREA M²	AREA FT²	RATE	REPLACEMENT COST	DISTURBANCE ALLOWANCE	TOTAL COMPENSATION	PHOTO
		Main House Foundation: Earth Floor: Earth Walls: Wood Poles and Iron Sheet Doors: Wooden Window: Wooden Roof: Flat on wooden Trusses			TEMPORARY	18.5	199.134	800.00	159,307.20	23,896.08	183,203.28	
		OVERAL TOTAL COMPENSATION									183,203.28	

4	NAME OF PROPERTY OWNE	PHONE CONTACT	PLOT NO.	ID NO.		GPS-coordinate						
	suleiman Kipronoh	726483794		25299310								
	NO:1	DESCRIPTION			NATURE	AREA M^2	AREA FT^2	RATE	REPLACEMENT COST	DISTURBANCE ALLOWANCE	TOTAL COMPENSATION	PHOTO
		Main House Foundation: Earth Floor: Earth Walls: Mud and Wooden Poles Doors: Wood Window: Wood Roof: Double Piched Iron sheet on wooden trusses			TEMPORARY	18	193.752	1,200.00	232,502.40	34,875.36	267,377.76	
		OVERAL TOTAL COMPENSATION									267,377.76	
5	NAME OF PROPERTY OWNE	PHONE CONTACT	PLOT NO./I	ID NO.		GPS-coordinate						
	Nehemiah Bunet		102									
	No.1	DESCRIPTION			NATURE	AREA M2	AREA FT2	RATE	REPLACEMENT COST	DISTURBANCE ALLOWANCE	TOTAL COMPENSATION	PHOTO
		Barberd Wire Fence, 4 Strand Wooden Poles Fence			TEMPORARY	209		150	125400	18,810.00	144,210.00	

Appendix 4: Valuation of Trees Sheet

PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
722247710	Karanja Kibuku			
NO	TYPE	SIZE	UNIT COST	TOTAL COST
20	Gravelia Trees	large	5000	100000
10	Blue gum	Large	8000	80000
5	Indegenous Trees	large	4000	20000
		TOTAL COMPENSATION		***200000***
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
720310574	Walter Mukanzu		2168874	
NO	TYPE	SIZE	UNIT COST	TOTAL COST
1	Indegenous Trees	large	6000	6000
		TOTAL COMPENSATION		***6000***
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
721426173	John Kibeigo Kendele		931363	
NO	TYPE	SIZE	UNIT COST	TOTAL COST
5	Indegenous Trees	Medium	5,000	25000
		TOTAL COMPENSATION		***25000***
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
713286859	Kipkoech Tue		5985656	
NO	TYPE	SIZE	UNIT COST	TOTAL COST
5	Indegenous Trees	Medium	5000	25000
5	Exotic Trees	Medium	5000	25000
		TOTAL COMPENSATION		***50000***
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
	Nehemiah Bunet			
NO	TYPE	SIZE	UNIT COST	TOTAL COST
30	Gravelia Trees	large	5000	150000
10	Gravelia Trees	Medium	5000	50000
20	Cyprus	Medium	5,000	100000
		TOTAL COMPENSATION		***300000***

PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate	
726483794	Suleimani Kiprono		25299310		
NO	TYPE	SIZE	UNIT COST	TOTAL COST	
5	Gravelia Trees	Medium	5000	25000	
		TOTAL COMPENSATION		***25000***	
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate	
729557982	Tabitha Nyamboke		13329989		
NO	TYPE	SIZE	UNIT COST	TOTAL COST	
2	Gravelia Trees	Medium	5000	10000	
		TOTAL COMPENSATION		***10000***	
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate	
722833413	James K Mwangi		4442506		
NO	TYPE	SIZE	UNIT COST	TOTAL COST	
10	Exotic Trees	Medium	5000	50000	
		TOTAL COMPENSATION		***50000***	
PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate	
	Maina Kamau				
NO	TYPE	SIZE	UNIT COST	TOTAL COST	
4	Exotic Trees	Medium	5000	20000	
		TOTAL COMPENSATION		***20000***	

PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
722833413	Maina			
NO	**TYPE**	**SIZE**	**UNIT COST**	**TOTAL COST**
4	Exotic Trees	Medium	5000	20000
TOTAL COMPENSATION				***20000***

PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
728470478	Susan Wacheria Njenga		4690053	
NO	**TYPE**	**SIZE**	**UNIT COST**	**TOTAL COST**
2	Exotic Trees	Medium	5000	10000
TOTAL COMPENSATION				***10000***

PHONE NUMBER	NAME OF PROPERTY OWNER	PLOT NO.	ID NO.	GPS-coordinate
711407983	Grace Njeri Ndirangu			
NO	**TYPE**	**SIZE**	**UNIT COST**	**TOTAL COST**
2	Exotic Trees	Medium	5000	10000
TOTAL COMPENSATION				***10000***