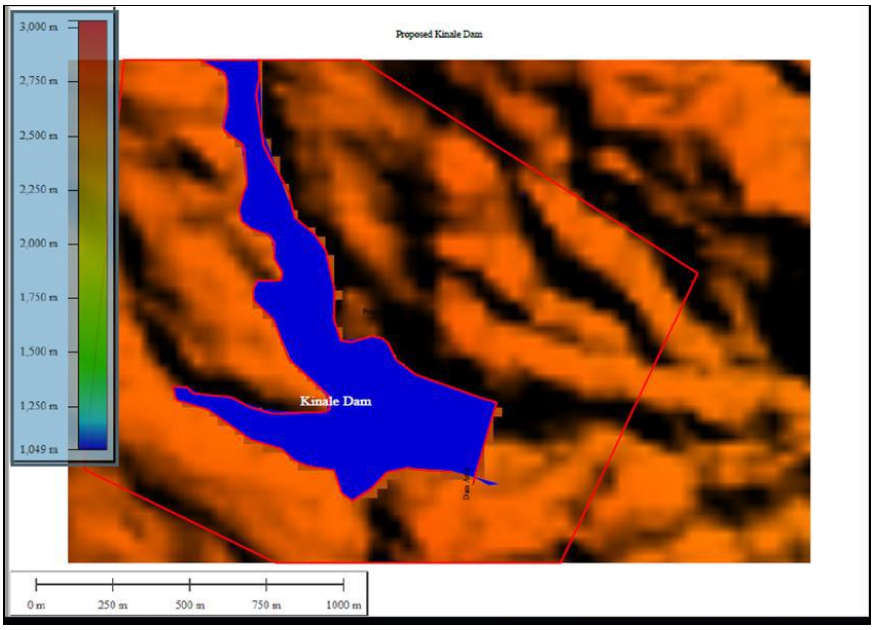
ATHI WATER WORKS DEVELOPMENT AGENCY



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT

FOR

KINALE DAM WATER PROJECT

In

KIAMBU COUNTY

February 2021

Proponent Athi Water Works Development Agency (AWWDA)

Assignment: Environmental and Social Impact Assessment Study Report for the Proposed Kinale Dam Water Project

Report Title: Environmental Impact Assessment Study Report

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Signed: _____ **Date:** 3/2/2021

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Table of Contents

LIST OF FIGURES

LIST OF TABLES

Executive Summary

The Context

The Kenyan Constitution of 2010 recognizes Water as a basic human right. The Constitution stipulates in its Part 4 – Rights and Fundamental Freedoms, Section 43 (1) of the Economic & Social Rights that "Every person has the right (to) clean and safe water in adequate quantities." It is in this light that the proposed Kinale Dam Water Supply project is being prioritized to have the provision of clean and affordable water supply to the residents of Lari and Limuru sub counties.

The proposed project is in line with the Athi Water Works Development Agency's strategic plan of 2018 – 2022, the Vision 2030 and the Sustainable Development Goal (SDG) 6 which all have the objective of ensuring sustainable management of water and sanitation. The GOK recognizes the importance water and sanitation plays in the performance of key sectors of the economy and the livelihoods of Kenyans. In the Vision 2030, the GOK underscores the importance of investing in water supply and sanitation services (WSS) as a fundamental need for productive livelihoods.

Project Scope

The proposed water supply project involves construction of a dam to supply water to Lari and Kinale project areas, a water treatment plant capable of supplying 4,000m^3/day of water per day, raw and treated water pipelines. The proposed scope of works is as follows;

Kinale dam Height 22m, Combined Net Yield of 4,000M^3/d;

a. Construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Side Spillway Channel), Diversion Tunnel, intake tower & , draw-off, tower access bridge.
b. Raw water mains 500mm internal diameter (Steel pipe), 3.6 km long through the forest area.
c. Conventional full treatment plant with a capacity of 4,000m^3/day. This include the offices, operators' houses, and a storage tank
d. 30 km distribution lines from the treatment plant and run along the Nakuru – Nairobi Highway. The off takes shall be made to feed the existing pipelines to Limuru town, Kimende, Kwa mbira and Ndeiya. There will be three balancing tanks for Limuru, Kimende and Bibirioni.

Water Service Providers (WSP)

The WSP that are set to increase their distribution network from this proposed project is Limuru Water and Sewerage Company (LIWASCO).

Project Justification

About 90% of the country's water resource comprises of both surface water resources and ground water potential. The county is divided into several sub-catchments' areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi river sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two subcatchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares range. Last one is Ewaso Kedong sub catchment which runs in the North-

South direction and occupies the western part of the county. It has several streams that normally form swamps.

The Eastern part of the County that include Thika, Gatundu, Ruiru and Juja is well endowed with surface water where major rivers like Chania, Thika, Karimenu, Ruabura, Ndarugu, Thiririka, Theta, Mukuyu, Ruiru and many others traversing the area. The Feasibility Study and Master Plan for Developing New Water Sources for Nairobi and Satellite Towns has proposed various sites for dams which mostly provide gravity systems for both domestic and irrigation purposes. These can reduce electricity costs which is a major bottle neck in water service delivery due to high cost of pumping which further increases the cost of water provision. The pipe distribution network within the current surface area of the Water Service Providers (WSPs) is fairly well done, however the major bottleneck especially for the rural WSPs is high non-revenue water (NRW). This is largely as a result of the customers connecting themselves illegally while others irrigate with water that is meant for domestic use which denies people on the downstream side access to water.

The Western part of the County covers Limuru, Kikuyu, Kiambu, Karuri, Lari and Githunguri areas which have limited surface sources except for Lari which has surface sources. Therefore, majority of the water systems here rely on boreholes as the main source of water supply. Some of the areas like Kiambu and its environs have ground water with high fluoride content. Due to inadequate ground water exploitation and high cost of operation and maintenance due to high electricity costs, the water coverage in the western part is very low with areas like Ndeiya having no supply although is the driest part of the County. It is important to construct proposed dams like Riara, Ruiru II, Tigoni, Kamiti and others which have been proposed to solve the problem in these areas. To ensure that the county benefits from the abundance of the water resources there is need for major investment in dam construction and distribution of pipe network.

The existing water schemes which are all pumping schemes have a total production capacity 10,800 m^3/day. The present water demand is estimated at 35,000m^3/day. Therefore, the existing water schemes are only able to meet 30% of the total water demand at the present. This gives a clear indication of the sad state of water supply and coverage in the project area.

According to the latest impact report, Issue No. 12/2020 Limuru Water and Sewerage Company which serves the two sub counties of Limuru and Lari has a serviceable population of 294,617 of which 146,927 people are served. This represents about 50% coverage. The coverage does not necessarily indicate adequacy of water supply. The production of Liwasco is 1,678,000 m^3/year which translates to 4,600 m^3/day. This gap in coverage and adequacy necessitates the development of the new water sources.

ESIA Objective and Scope

The main objective of the assignment is to carry out an environmental and social impact assessment for Kinale Dam Water Project. The assessment is in compliance with EIA regulations of 2003 as established under the EMCA, 1999 with amendments of 2015.

The ESIA study was implemented in two phases:

i. Preliminary study which culminated in the development of the Terms of Reference (ToR) for the Full ESIA Study. The ToR was submitted to NEMA on 5th November 2020 for approval.
ii. Full ESIA during the detailed design phase (this report).

Noting that the dam will be located within Kinale Forest and the consequent environmental concerns around site clearance, river diversion and the associated pollution from the works, the proposed project will have direct linkages on both environment and social settings. For a sustainable implementation of the project, appropriate measures should be established to mitigate associated impacts. In addition, the project needs to be approved by the National Environment Management Authority (NEMA) and Kenya Forest Service (KFS). To achieve this, an environment and social management plan has been developed to guide the project on the integration of environmental and social aspects into the project. The management plan will be revised by the contractor for use during construction phase.

Key Observations
The project has the potential to trigger the environmental and social impacts listed below;

Issues	Anticipated Linkages
Environmental	**Construction** ▪ Loss of vegetation cover/terrestrial habitat (shrubs, grass and trees) ▪ Soil loss (from excavations during construction) including spoil management ▪ Siltation of surface water sources during construction of the dam ▪ Dust emissions ▪ Disruption of surface drainage ▪ Noise and Vibrations ▪ Waste management ▪ Ecological disruption
	Operations ▪ Alterations of the river flow, water quality and downstream ecology ▪ Sedimentation in the reservoir ▪ Migration and productivity of fish species ▪ Risk of eutrophication / growth of non-native and/or invasive species. ▪ Waste Management (including chemicals, dry sludge and domestic wastes) ▪ Water wastage ▪ Pollution to surface sources of water ▪ Status of surface drainage
Social	**Construction** ▪ Loss of Livelihood for communities currently under PELIS system ▪ Health and safety ▪ Sanitation and hygiene ▪ Employment opportunities ▪ Immigration by construction workers ▪ Dusty conditions from construction works ▪ Disruption of water sources ▪ HIV/AIDS Linkages ▪ Spread of Covid-19 ▪ Child labour ▪ Conflicts on access roads
	Operations ▪ Health and safety including risks of drowning

Issues	Anticipated Linkages
	▪ Sanitation and Hygiene ▪ Access to treated water ▪ Employment opportunities ▪ Waste disposal ▪ Creation of favourable habitats for the growth and proliferation of disease vectors
Resettlement Issues	The project is not displacing any people. However, there are some persons who have encroached into the conservation areas and will result in loss of economic activities (farming activities).

Anticipated Impacts
The proposed Kinale Dam Water Project has an overall benefit to Kiambu County, due to increased access to clean water that is now critical in the fight against Covid-19 Pandemic spread and control. In addition to the direct benefits to the target population in Kiambu County, the increased water into these zones is a desired achievement in reducing health risks especially in water borne diseases including typhoid, Diarrhoea, skin diseases eye infections e.tc.

The works location are within Kinale Forest, Conservation Areas, along road reserves, river riparian and to a limited extent on private farms and the major impact is the loss of the associated vegetation, surface soil disruption, and limited local drainage disruption especially during the dam works construction. At the social front, there is no direct disruption of the social setting but concerns on social benefits including connections of treated water that cannot be ignored.

EMP Outline
The main objective of the proposed Kinale Dam Water Project is to enhance the social and economic wellbeing of the target population in Kiambu County and her immediate neighbourhoods. While appreciating these benefits, it should be noted that the project also has environmental linkages requiring protection interventions in accordance to the established laws and regulations to ensure sustainability and full acceptability by the local communities. To realize this goal, minimal effects to the social and physical environment will require to be integrated into the project through consultations, evaluations and review of the design aspects and monitoring thereafter.

It is recommended that guiding principles specific to this project and the regulations governing water resources management be developed that will allow integration of environmental management considerations in the construction, maintenance of the facility components and public amenities.

In order to implement the environment management plan, it is recommended that the Contractor engage a qualified environmentalist to oversee the environmental integration during the construction while a specific Officer is identified for management of environmental aspects during the operations including pollution control, water loss control, waste management, beautification, management of sanitation and hygiene measures and safety. In each phase the responsible person will be expected to co-ordinate and monitor environmental management during construction and provide monitoring schedules during operations.

Conclusions

The main benefit expected from Kinale dam water project is reducing the current water demand deficit in Lari and Limuru sub counties significantly as outlined in this ESIA report.

After assessment of Environmental and Social impacts of the Dam, the conclusion is that the proposed Kinale Dam is feasible in terms of Environmental and Social acceptability. The main support for this conclusion includes the following:

(i) The proposed dam is generally acceptable by a majority of the local community, most of whom appreciate the value of the dam but part of the community feels they will be affected through loss of properties and demands appropriate compensation,
(ii) The dam development provides moderate ecological challenge consisting in loss of land and forest cover, likely immigration of new plants and animal species into the area as well as slight changes in the localized micro-climatic conditions.
(iii) Water quality is an important attribute towards the feasibility of the dam project. In this regard, it is noted that the catchment (Kinale Forest) and the immediate watersheds are undergoing serious degradation through deforestation and settlements. Sustainability of the dam water quality and the health of the dependants could therefore be jeopardized in the long term. Catchment protection strategies is therefore key for the sustainability of the dam.
(iv) The dam construction has potential linkages to the environmental and social settings, in each case posing short- and long-term co-existence. Social benefits are to enhanced while mitigation of negative impacts constitutes a larger part of this ESIA Report. This calls for collaborative management plans focused on the various social and environment sub-sectors.

Recommendations

(i) Social and environmental impacts will be addressed by ensuring appropriate tools have been developed and adopted. These tools, to be prepared under the Construction Environment and Social Management (C-ESMP) will include the following.
    - Health and Safety Plan;
    - Air Quality Management Plan;
    - Noise Management Plan;
    - Stakeholders and Social Engagement Plan;
    - Labour Management Plan;
    - Gender Management Plan;
    - Waste Management Plan (including spoil disposal).
(ii) The implementation of the project should blend with the surrounding land use trends.
(iii) The dam development and operations thereafter should consider integration of comprehensive Catchment Management Plan with involvement of relevant communities in the key watersheds.
(iv) It is recommended that a weather station be provided at the dam to facilitate monitoring of ecological transformation trends and emergent climatic conditions.

1.1 Project Background

The Kenyan Constitution of 2010 recognizes Water as a basic human right. The Constitution stipulates in its Part 4 – Rights and Fundamental Freedoms, Section 43 (1) of the Economic & Social Rights that "Every person has the right (to) clean and safe water in adequate quantities." It is in this light that the proposed Kinale Dam Water Supply project is being prioritized to have the provision of clean and affordable water supply to the residents of Lari and Limuru sub counties.

The proposed project is in line with the Athi Water Works Development Agency's strategic plan of 2018 – 2022, the Vision 2030 and the Sustainable Development Goal (SDG) 6 which all have the objective of ensuring sustainable management of water and sanitation. The GOK recognizes the importance water and sanitation plays in the performance of key sectors of the economy and the livelihoods of Kenyans. In the Vision 2030, the GOK underscores the importance of investing in water supply and sanitation services (WSS) as a fundamental need for productive livelihoods.

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Potable Water Demand Forecast Limuru area is indicated in Table 1.1.

Table 1.1: Overall Water Demand Requirements

Year	Present year 2020	Initial year 2023	Future year 2033	Ultimate year 2043
Limuru Water Demand (m^3/day)	21,636.67	22,510.79	27,440.53	33,449.86

Source: 'Kinale Dam Water Project: Project Feasibility Report – Athi Water Works Development Agency

1.2 The Project

The proposed water supply project involves construction of a dam to supply water to Lari and Limuru project areas, a water treatment plant capable of supplying 4,000m^3/day of water per day, raw and treated water pipelines. The proposed scope of works is as follows;

Kinale dam Height 22m, Combined Net Yield of 4,000M^3/d;

a. Construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Side Spillway Channel), Diversion Tunnel, intake tower & , draw-off, tower access bridge.
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d. 30 km distribution lines from the treatment plant and run along the Nakuru – Nairobi Highway. The off takes shall be made to feed the existing pipelines to Limuru town, Kimende, Kwa mbira and Ndeiya. There will be three balancing tanks for Limuru, Kimende and Bibirioni.

Figure 1.1 below is a schematic diagram of the proposed dam project.

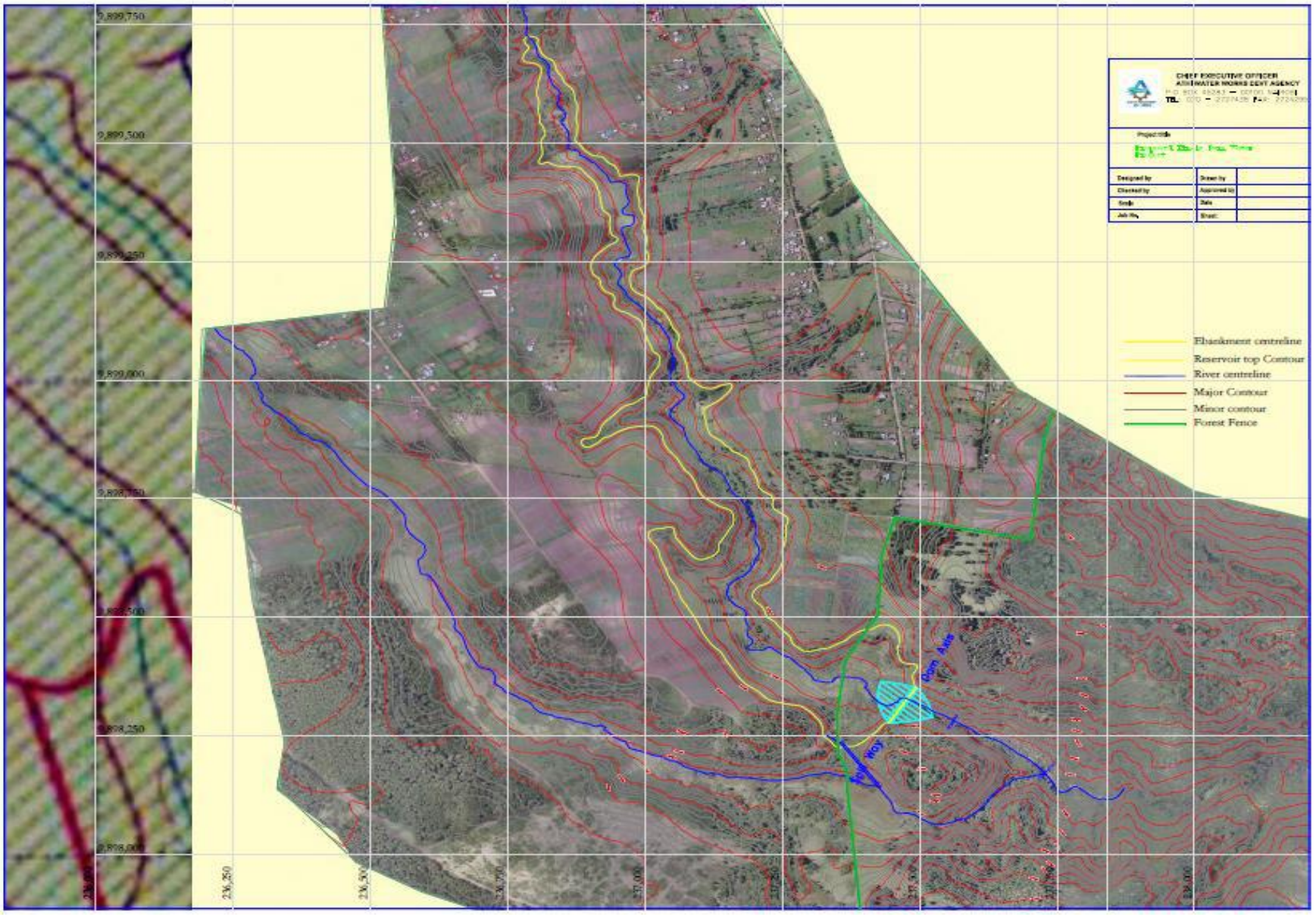


Figure 1.1: Proposed Kinale Dam Water Project

1.3 Project Cost

The total estimated project costs from feasibility is approximately Kshs 1.5 billion as shown in the Table 1.2 below:

Table 1.2: Estimated Project Cost

PROPOSED KINALE DAM WATER SUPPLY PROJECT				
ITEM NO.	**DESCRIPTION**	**RATE (Kshs.)**	**AMOUNT (Kshs.)**	
	WATER SUPPLY			
1	**Kinale Dam**		**551,000,000.00**	
2	**Treatment Works**		**265,000,000.00**	
3	**Storage Tanks**		**34,000,000.00**	
4	**Raw Water Main**		**40,000,000.00**	
5	**Distribution Mains (30 Kms)**		**150,000,000.00**	
	SUB- TOTAL 1		**1,040,000,000.00**	
	ADD 10% FOR ENGINEERING COSTS & PRELIMINARIES		**104,000,000.00**	
	SUB- TOTAL 2		**1,144,000,000.00**	
	ADD 15% CONTINGENCY		**171,600,000.00**	
	SUB TOTAL 3		**1,315,600,000.00**	
	ADD 14% VAT		**184,184,000.00**	
	GRAND TOTAL		**1,499,784,000.00**	

1.4 The Proponent

Athi Water Works Development Agency (AWWDA) is one of the eight WWDAs established under the Water Act, 2016 to take charge of the Nairobi City, Kiambu and Murang'a Counties. The Agency is mandated to;

(i) Undertake the development, maintenance and management of the national public water works within its area of jurisdiction;
(ii) Operate the waterworks and provide water services as a water service provider, until such a time as responsibility for the operation and management of the waterworks are handed over to a county government, joint committee, authority of county governments or water services provider within whose area of jurisdiction or supply the waterworks is located;

(iii) Provide reserve capacity for purposes of providing water services where, the Regulatory Board orders the transfer of water services functions from a defaulting water services provider to another licensee;
(iv) Provide technical services and capacity building to such county governments and water services providers within its area as may be requested; and
(v) Provide to the Cabinet Secretary technical support in the discharge of his or her functions under the Constitution and the Water Act, 2016.

1.5 ESIA Justification

The main objective of the assignment is to carry out an environmental and social impact assessment associated with Kinale Dam Water Supply Project. The assessment is in compliance with the current NEMA requirements of EIA regulations of 2003 as established under the EMCA, 1999 with amendments of 2015.

The ESIA study was implemented in two phases:

i. Preliminary study which culminated in the development of the Terms of Reference (ToR) for the Full ESIA Study. The ToR was submitted to NEMA on 5th November 2020 for approval.
ii. Full ESIA during the detailed design phase (this report).

Noting that the dam will be located within Kinale Forest and the consequent environmental concerns around site clearance, river diversion and the associated pollution from the works, the proposed project will have direct linkages on both environment and social settings. For a sustainable implementation of the project, appropriate measures should be established to mitigate associated impacts. In addition, the project needs to be approved by the National Environment Management Authority (NEMA) and Kenya Forest Service (KFS). To achieve this, an environment and social management plan has been developed to guide the project on the integration of environmental and social aspects into the project. The management plan will be revised by the contractor for use during construction phase.

1.6 The EIA Objectives and Scope

The main objective of the assignment was to carry out an environmental and social impact assessment of the proposed project;

(i) Provide a background, scope, objectives of the project with respect to environmental and social aspects,
(ii) Review and analyse policies, legal and institutional framework governing environmental resources management in Kenya,
(iii) Review of documented information and data on the areas affected by the project,
(iv) Examine and document the environmental and social baseline conditions of the project areas,
(v) Identify all environmental and social impacts (positive and negative) associated with the project preparation, construction, operations and decommissioning stages and establish appropriate mitigation or preventive measures,
(vi) Develop a comprehensive environmental and social management plan (EMP) for integration into the project implementation process,

The scope of the ESIA Report was to develop suitable recommendations to be integrated in the project design and implementation for mitigation of anticipated adverse impacts to the environment

and social setting of the project and service areas. An evaluation of public opinions and stakeholders' attitude towards the project was captured through interviews and consultative forums conducted throughout the project area. Details of stakeholder consultations is presented in Chapter 5 of this report. This study has been conducted in compliance with the Environmental Impact Assessment Regulation as outlined under the Gazette Notice No. 56 of 13 June 2003 established under the Environmental Management and Coordination Act (EMCA), Amendments 2015.

1.7 ESIA Approach Outline

1.7.1 Key Areas of Focus

In accordance to the EIA regulations the objectives of the study included the following key issues;

(i) A clear description of the proposed project including its objectives, design concepts, proposed water uses and anticipated environmental and social impacts,
(ii) Description of the baseline conditions in the project areas such as to cover the physical location, environmental setting, social and economic issues,
(iii) A description of the legal, policy and institutional framework within which the proposed project will be implemented
(iv) Description of the project alternatives and selection criteria,
(v) Details of the anticipated impacts to the environment, social and economic aspects of the area covered by the project.
(vi) Appropriate mitigation and/or corrective measures,
(vii) Develop an environmental management plan (EMP) presenting the project activities, potential impacts, mitigation actions, targets and responsibilities, associated costs and monitoring indicators,

This approach was used to identify impacts that would arise from the proposed project activities determined on the basis of the baseline conditions established during the field work and project information obtained from the design documents reviewed. For subjective predictions of the impacts, the site area was subjected to an evaluation of the significant impacts and appropriate level of assessment necessary.

1.7.2 ESIA Scoping Activities

In order to adhere to the Kenyan policy legislation and the international standards, AWWDA undertook a scoping study from 21st to 25th September 2020 designed to provide a preliminary view of the environmental and social status of the proposed project and to develop the Terms of Reference for the Full ESIA Study. The ToR was submitted to NEMA in November 2020 and approved on 3rd February 2021.This is important since environmental and social aspects can have a decisive influence on the option evaluation and the overall feasibility of the project.

1.7.3 Stakeholders Participation

During the scoping studies and Full ESIA studies a number of stakeholders were consulted including:

- Kenya Forest Service (KFS);
- Water Resource Users Associations (WRUA) for Thiririka and Gatamayu sub-catchments;
- National Government Administration Officers for Lari and Limuru Sub-Counties;
- The local communities within Lari and Limuru Sub-counties;
- Project Affected Persons.

Details of the deliberations are outlined in Chapter 5.

Chapter 2: Analysis of Alternatives

2.1 Introduction

The Environmental Impact Assessment Study should identify and assesses alternatives to the proposed development/project. Only the best alternative (one with the least adverse impacts) should be selected based on less negative impacts and cost-benefit analysis. An important alternative to be analysed always is the “without project” alternative. This is a very important analysis because it helps the proponents measure the impacts from the project against those which would have taken place without the project.

2.2 Alternative of “Without Project”

According to chapter 1 of this report, the purpose of this project is the supply of drinkable water to Lari and Limuri sub counties within Kiambu County.

Without this project, the water supply will not be adequate with the water demand and an important shortage of water will be faced. The shortage of water has important environmental and social impacts on the population and the main purpose of the Kinale Dam project is to permit the access to the water to the satellite towns of Lari and Limuri. Therefore, the “without project” alternative will have a wide impact on the quality of life on more than 300,000 people living in the target area.

2.3 Alternative Dam Sites

The feasibility study concentrated on Kinale Dam along Gatamaiyu River. 4 sites were considered depending on the following 5 key factors;

- Topography of reservoir area
- Hydrology – Runoff Yield
- Socio - Economic and Environmental Considerations
- Gravity Supply
- Raw Water Quality and Sources of Pollution
- Geology

The potential dam sites were identified based on maps, site visits and detailed survey. Based on topography at the axis, the site properties i.e., the volume- inundation area against the height for successive 1m increase in height to highest possible ground levels. It must be noted that the height and the crest length of a dam are the main factors determining the volume of fill materials for the embankment wall.

In estimating the run off yields, preliminary figures were adopted from a pre-feasibility report undertaken by National Water and Harvesting Authority.

Figure 3.1 shows the 4 alternative dam sites.

Figure 3.1: The Four Alternative Dam Sites

2.3.1 Dam Site 1

The site lies on upstream of the waterfall along Gatamaiyu River at the coordinates UTM 37, 237529.630Easting, 9898298.170 Northings. The profile of the dam axis at the proposed site is as follows;

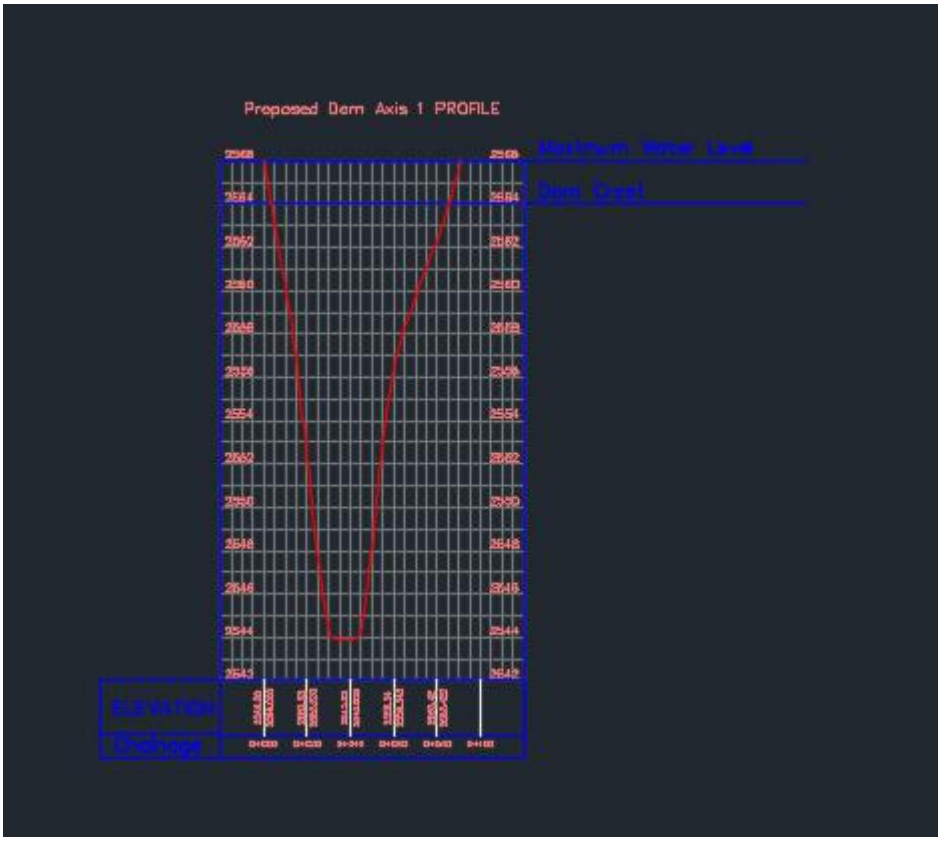


Figure 2.1: Option 1 Dam Axis Profile

The theoretical maximum of the dam that can be constructed on this site is 22m. The elevation of the non-overflow crest would be 2566 masl while the lowest point on the river bed is 2544 masl. The maximum reservoir capacity at elevation 2564m would be would be 1,337,139 m^3, of water with a gross freeboard of 2m.

- Dam Height = 22m
- Dam Crest Length=93m
- Dam Crest Width Top=10m
- Total Volume of water to be impounded= 1,337,139 m^3
- Area of reservoir=45 Acres

Other Characteristics as adopted from the draft hydrology report

- Dam Catchment Area =12.2 km^2
- Volume of Water Available from catchment=4.89 x 106 m^3
- Average Annual Rainfall = 1200mm

The Volumes and areas of the Contours as extracted from high resolution aerial mapping using UAV (Unmanned Aerial Vehicle) is as follows;

Table 2.1: Volumes - Contours for Dam Option 1

CONTOUR	2D AREA M^2	3D AREA M^2	VOLUME M^3
2,567	193,159	206,737	1,865,358
2,566	181,728	194,252	1,677,875
2,564	158,996	169,422	1,337,139
2,562	135,762	144,158	1,041,755
2,560	110,978	117,501	790,933
2,558	89,163	94,112	589,198
2,556	73,230	76,936	426,278
2,554	60,666	63,363	292,333
2,552	44,825	46,633	18,413
2,550	31,878	32,989	106,321
2,548	21,821	22,379	51,773
2,546	10,399	10,559	15,334
2,544	0	0	0

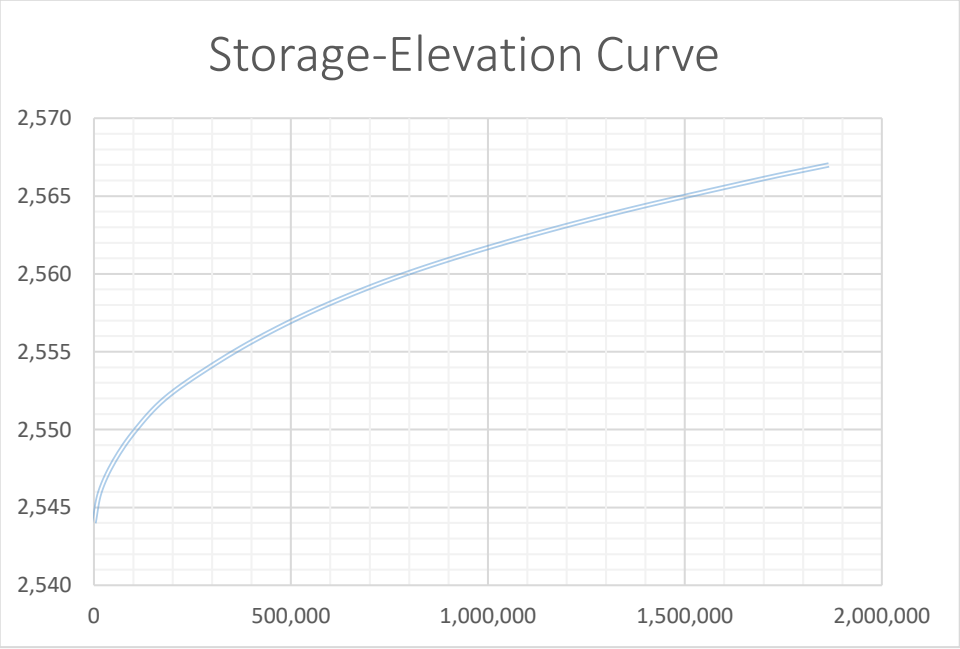


Figure 2.2: A graph of Elevations Against the Storage for Dam Site 1 A long Gatamaiyu River

From the hydrology, the amount of water available is about 4.8 Mm^3 against the available storage of 1,337,139 m^3. It is recommended that a suitable site with a bigger reservoir characteristic be adopted.

2.3.2 Dam Site '2'

The site lies downstream of the waterfall and about 400 metres downstream of dam site 1 and after the confluence of two Gatamaiyu River/ streams at the coordinates UTM 37, 237529.630 Easting, 9898298.170 Northing.

The profile of the dam axis at the proposed site is as follows;

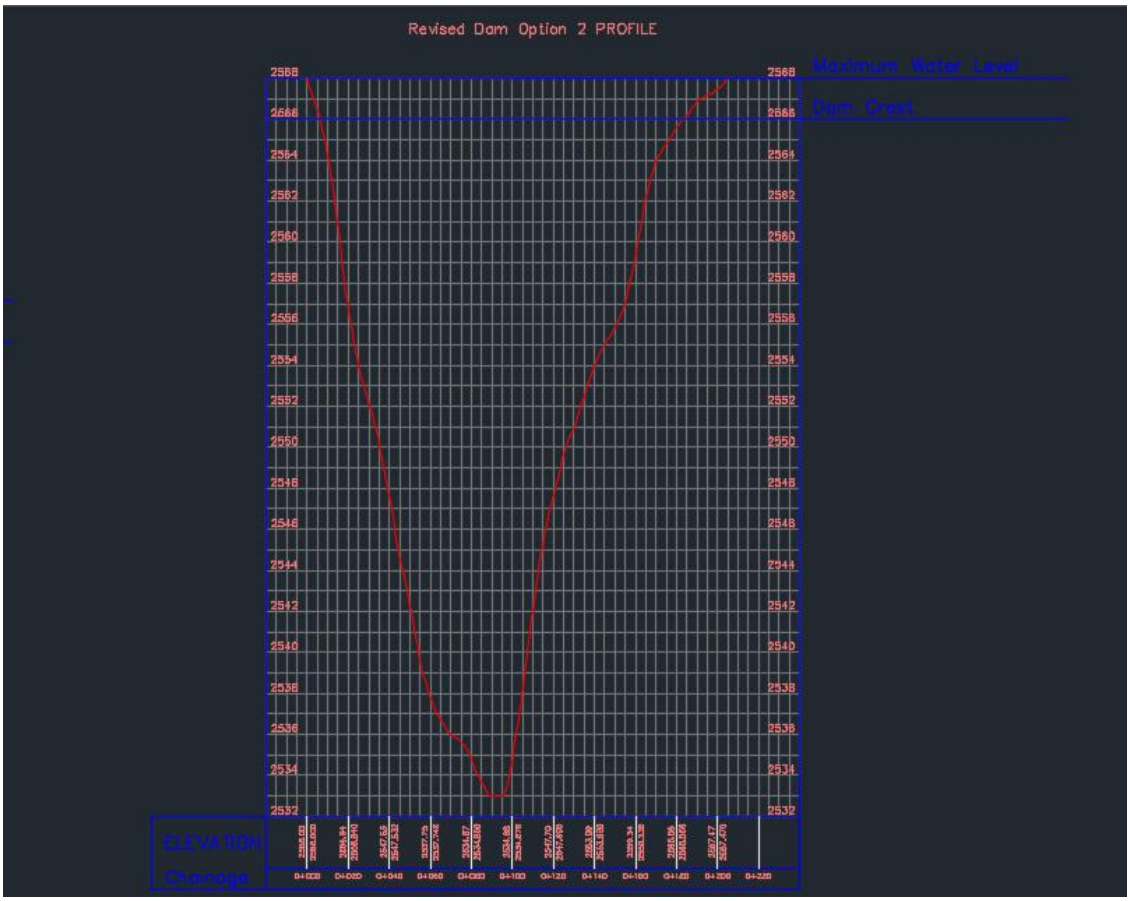


Figure 2.3: Option 2 Dam Axis Profile

The theoretical maximum of the dam that can be constructed on this site is 34m. The elevation of the non-overflow crest would be 2568 masl while the lowest point on the river bed is 2534 masl. The maximum reservoir capacity at elevation 2564m would be would be 3,710,061m^3, of water with a gross freeboard of 4 m.

- Dam Height = 34m
- Dam Crest Length=204 m
- Dam Crest Width Top=10 m
- Total Volume of water to be impounded= 3,710,061m3 m^3
- Area of reservoir=97.84Acres

Other Characteristics as adopted from the draft hydrology report

- Dam Catchment Area =12.2 km2
- Volume of Water Available from catchment=4.89 x 106 m^3
- Average Annual Rainfall = 1200mm

The Volumes and areas of the Contours as extracted from high resolution aerial mapping using UAV (Unmanned Aerial Vehicle) is as follows;

Table 2.2: Volumes - Contours for Dam Option 2

CONTOUR	2D AREA M^2	3D AREA M^2	VOLUME M^3
2,569	421,084	462,896	5,527,471
2,568	395,981	435,757	5,118,249
2,566	350,480	386,160	4,372,030
2,564	311,418	343,010	3,710,061
2,562	272,590	300,266	3,124,890
2,560	233,693	257,681	2,614,026
2,558	194,664	215,375	2,182,226
2,556	163,596	181,500	1,822,362
2,554	134,040	149,503	1,521,915
2,552	113,842	127,090	1,271,341
2,550	96,496	107,753	1,059,833
2,548	82,013	91,480	880,530
2,546	65,901	73,826	728,281
2,544	51,161	57,849	606,357
2,542	46,877	52,553	508,395
2,540	42,865	47,592	418,649
2,538	38,648	42,511	337,131
2,536	33,597	36,679	264,209
2,534	29,514	31,923	201,115
2,532	24,920	26,758	146,605
2,530	20,693	22,037	100,724
2,528	16,396	17,284	63,323
2,526	12,269	12,801	34,801
2,524	8,644	8,883	13,761
2,522	0	0	0

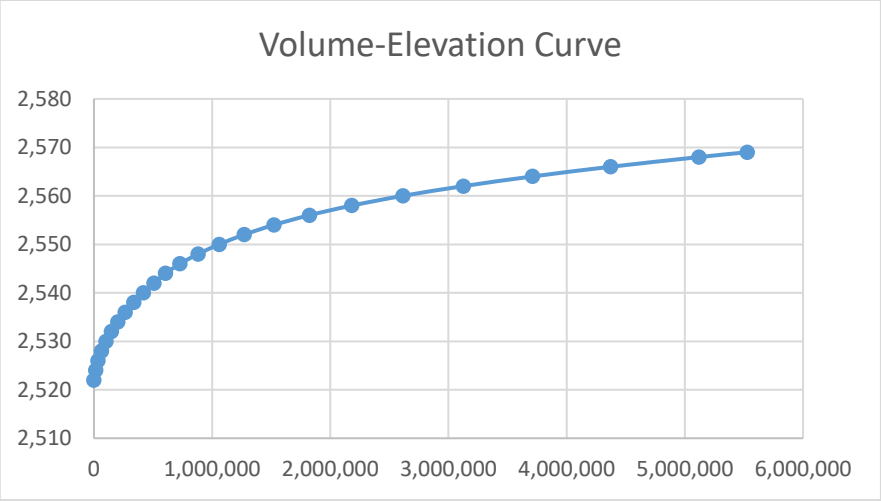


Figure 2.4: A graph of Elevations Against the Storage for Dam Site 2 A long Gatamaiyu River

From the hydrology, the amount of water available is about 4.5 Mm^3 against the available storage of 3,710,061 Mm^3. This site is considered suitable however the Cost of Construction is high and this site should be considered for future more studies.

2.3.3 Dam Site '3'

The site lies adjacent to dam site 1 on the other stream and is located at UTM 37237514.357 Easting, 9898061.097 Northing. This is the smallest of the four options considered under the feasibility study. The profile of the dam axis at the proposed site is as follows;

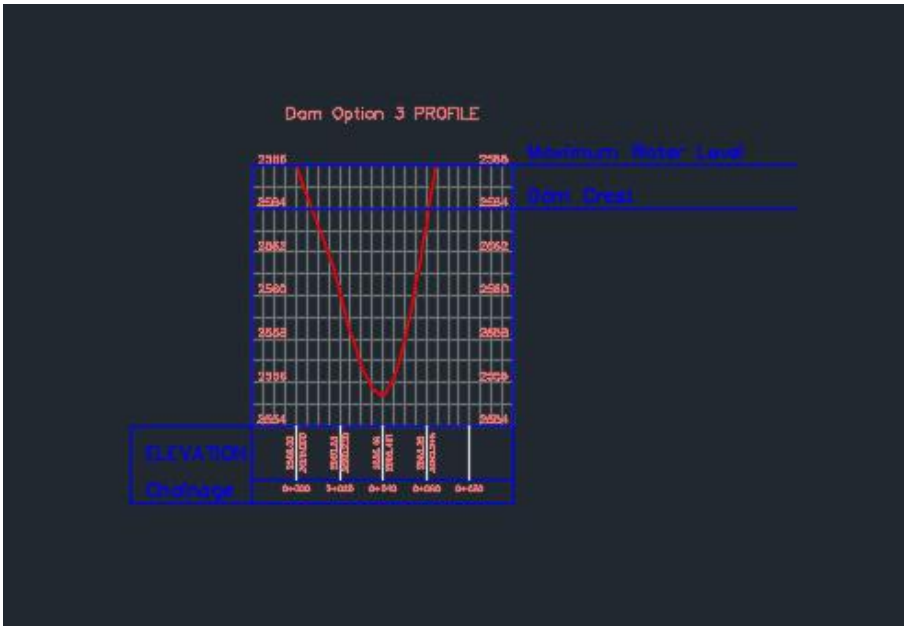


Figure 2.5: Option 3 Dam Axis Profile

The theoretical maximum of the dam that can be constructed on this site is 11m. The elevation of the non-overflow crest would be 2566 masl while the lowest point on the river bed is 2555 masl.

The maximum reservoir capacity at elevation 2562m would be would be 185,553 m^3, of water with a gross freeboard of 4m.

- Dam Height = 11m
- Dam Crest Length=64 m
- Dam Crest Width Top=10 m
- Total Volume of water to be impounded= 185,553 m^3
- Area of reservoir=16.24 Acres

Other Characteristics as adopted from the draft hydrology report

- Dam Catchment Area =12.2 km^2
- Volume of Water Available from catchment=4.89 x 10^6 m^3
- Average Annual Rainfall = 1200mm

The Volumes and areas of the Contours as extracted from high resolution aerial mapping using UAV (Unmanned Aerial Vehicle) is as follows;

Table 2.3: Volume -Contour data for Dam Option 3

CONTOUR	2D AREA M^2	3D AREA M^2	VOLUME M^3
2,567	73,398	76,241	472,378
2,566	65,722	68,211	402,452
2,564	53,807	55,633	282,907
2,562	43,088	44,328	185,553
2,560	34,051	34,774	107,962
2,558	22,067	22,398	50,227
2,556	12,205	12,299	14,971
2,554	0	0	0

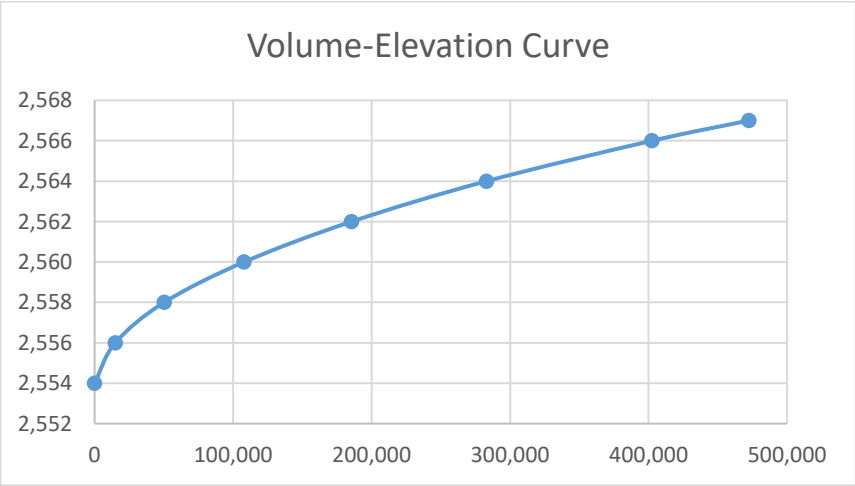


Figure 2.6: A graph of Elevations Against the Storage for Dam Site 3 A long Gatamaiyu River

From the hydrology, the amount of water available is about 4.5 Mm^3 against the available storage of 185,553Mm^3.

2.3.4 Dam Site '4'

The site lies downstream of the waterfall and about 200 metres downstream of dam site 2 and has great reservoir characteristics. The UTM 37 ,238251.314E, 9898150.609N.

The profile of the dam axis at the proposed site is as follows;

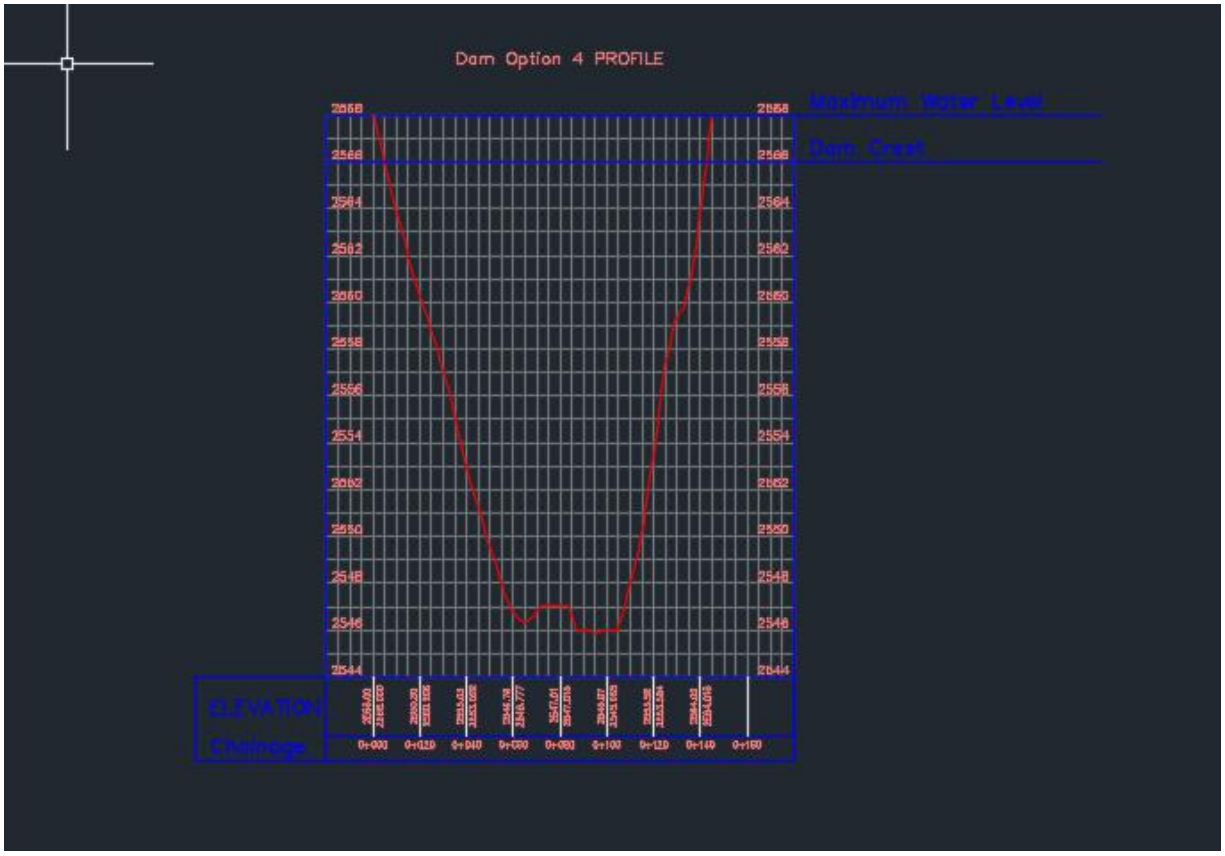


Figure 2.7: Option 4 Dam Axis Profile

The theoretical maximum of the dam that can be constructed on this site is 34m. The elevation of the non-overflow crest would be 2568 masl while the lowest point on the river bed is 2534 masl. The maximum reservoir capacity at elevation 2566 m would be would be 4,683,637m^3, of water with a gross freeboard of 4m.

- Dam Height = 34m
- Dam Crest Length=140 m
- Dam Crest Width Top=10 m
- Total Volume of water to be impounded= 4,683,637m^3
- Area of reservoir=116.78 Acres

Other Characteristics as adopted from the draft hydrology report

- Dam Catchment Area =12.2 km^2
- Volume of Water Available from catchment=4.89 x 10^6 m^3
- Average Annual Rainfall = 1200mm

Table 2.4: Volumes - Contours for Dam Option 4

CONTOUR	2D AREA M^2	3D AREA M^2	VOLUME M^3
2,569	500,000	544,503	6,863,805
2,568	472,615	515,025	6,376,810
2,566	421,263	459,449	5,482,208
2,564	377,344	411,356	4,683,637
2,562	333,890	363,875	3,971,252
2,560	290,075	316,229	3,342,305
2,558	245,542	268,290	2,802,426
2,556	210,559	230,400	2,344,789
2,554	177,258	194,515	1,954,136
2,552	152,975	167,870	1,621,095
2,550	131,475	144,207	1,335,195
2,548	113,018	123,801	1,089,948
2,546	91,797	100,859	880,475
2,544	71,138	78,738	721,565
2,542	63,198	69,559	604,990
2,540	56,071	61,243	498,192
2,538	45,944	50,063	401,186
2,536	38,976	42,171	314,409
2,534	33,386	36,392	239,327
2,532	28,160	30,504	174,460
2,530	23,383	25,122	119,862
2,528	18,527	19,704	75,354
2,526	13,864	14,593	41,413
2,524	9,768	10,127	16,376
2,522	0	0	0

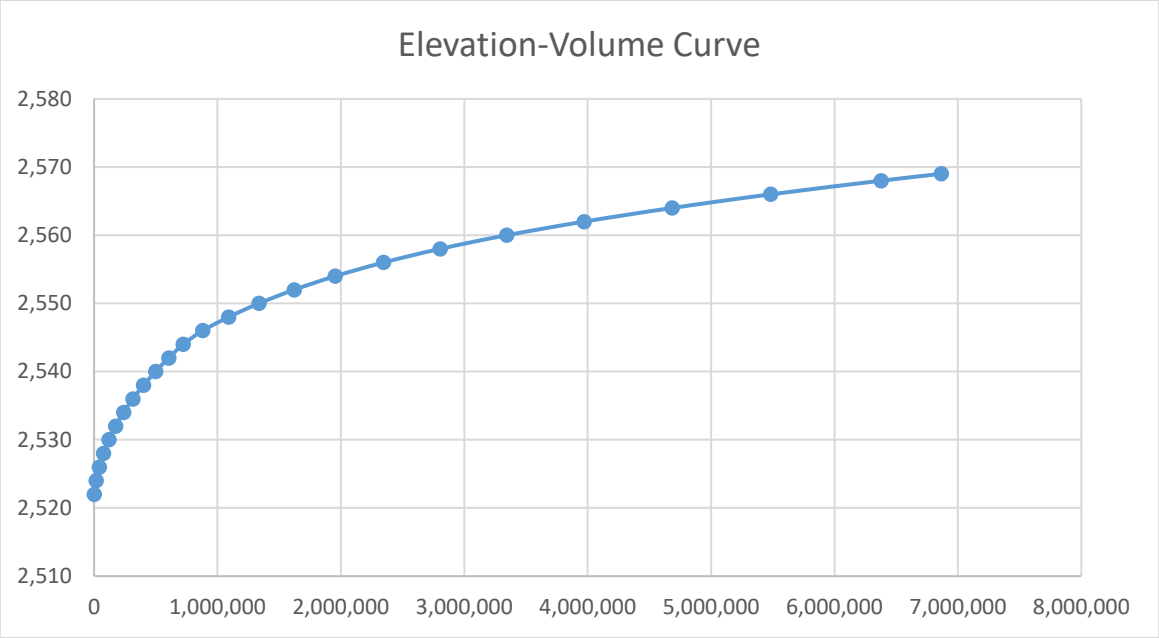


Figure 2.8: A graph of Elevations Against the Storage for Dam Site 4 A long Gatamaiyu River

2.3.5 Analysis and Comparison of Identified Sites

A summary of the 4 proposed dam sites is as shown in Table 2.5.

Table 2.5: Summary of the Dam Options and Characteristics

Site	Dam Height (m)	Catchment Area	Volume	Reservoir Volumes
1	22	12.2 km^2	4.89 x 10^6 m^3	1,337,139 m^3
2	34	12.2 km^2	4.89 x 10^6 m^3	3,710,061 m^3
3	11	12.2 km^2	4.89 x 10^6 m^3	185,553 m^3
4	34	12.2 km^2	4.89 x 10^6 m^3	4,683,637m^3

From the table above:

i. Site number 4 has the best topographical characteristics with the reservoir volumes of 4.7 m^3
ii. All the sites are able to serve the project service area by gravity.
iii. All the sites possess the same hydrological characteristics
iv. The sites are within the KFS land and as such human displacement is limited. However, more forest land will be required to undertake options 2,4 as compared to site 1 and 3.
v. Sites 2 and 4 are after the waterfall. The waterfall is 15 meters high which limits the storage capacity, drives the cost of construction. However, since site 4 and 2 are after the fall, a detailed study can be undertaken to review the viability in terms of cost and risks associated with construction of the dam in future.

2.3.6 Conclusion

For the immediate development and as concluded above, the most viable site is site No.1, which entails construction of a 22m high dam. The elevation of the non-overflow crest would be 2566 masl while the lowest point on the river bed is 2544 masl. The maximum reservoir capacity at elevation 2564 m would be would be 1,337,139m^3, of water with a gross freeboard of 2m. The dam crest length will be 93m.

Chapter 3: Policy, Legal and Institutional Framework

3.1 An Overview

Environmental Impact Assessment is a tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and peoples' health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighbourhood. Recent GOK efforts aimed at formulating a clear policy strategy has culminated in the enactment of a new legislation on water management. The Water Act 2016, is aimed at harmonizing and streamlining the management of water resources, water supply and sanitation services. Necessary policies and legislation that ensures annual environmental audits (EA) are carried out on every running project, activity or programme and a report submitted to National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates.

According to the Kenya National Environment Action Plan (NEAP 2016-2022) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. The NEAP process introduced environmental assessments in the country with among the key stakeholders being industrialists, business community and local authorities.

3.2 Policy Provisions

3.2.1 National Environment Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from economic and social development programmes that disregarded environmental sustainability. In this regard, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process, EIA was introduced and among the key participants identified were the District Development Committees.

3.2.2 National Policy on Water Resources Management and Development

The National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate it in a sustainable rational and economic way. It also desires to supply water of good quality and in sufficient quantities to meet the various water needs while ensuring safe disposal of wastewater and environmental protection. The policy focuses on streamlining provision of water for domestic use, agriculture, livestock development and industrial utilization with a view to realizing the goals of the Sustainable Development Goals (SDGs) as well as Vision 2030. To achieve these goals, water supply (through increased household connections and developing other sources) and improved sanitation is required in addition to interventions in capacity building and institutional reforms.

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. It, therefore, calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. Development projects, therefore, should be accompanied

by corresponding waste management systems to handle the wastewater and other waste emanating there from. The same policy requires that such projects should also undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighbourhood and further downstream are not negatively impacted by the emissions.

In addition, the policy provides for charging levies on waste water on quantity and quality (similar to polluter-pays-principle) in which case those contaminating water are required to meet the appropriate cost on remediation, though the necessary mechanisms for the implementation of this principle have not been fully established under the relevant Acts. However, the policy provides for establishment of standards to protect the water bodies receiving wastewater, a process that is ongoing.

3.2.3 Sessional Paper No. 6 of 1999 on Environment and Sustainable Development

Among the key objectives of the Sessional Paper No. 6 of 1999 on Environment and Sustainable Development (1993) include ensuring that development policies, programmes and projects take environmental considerations into account, ensuring that an independent environmental impact assessment (EIA) report is prepared for any development before implementation and to ensure that effluent treatment standards that conform to acceptable health standards.

This paper provided the basis for the environmental Policy framework that is in the process of formulation. Under this paper, broad categories of development issues have been covered that require sustainable approach. These issues include the waste management and human settlement sectors. The paper recommends the need for enhanced re-use/recycling of residues including wastewater and increased public awareness raising and appreciation of clean environment as well as the participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others for decent housing of every family.

3.3 Legal Framework

Applications of national statutes and regulations on environmental conservation suggest that the proposed project management institutions will have a legal duty and social responsibilities to ensure the proposed development is carried out without compromising the status of the natural resources in the area, public privacy, health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation. The key national laws that govern the management of environmental resources in the country have been briefly discussed below. It is noteworthy that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act (Amendments), 2015 prevails.

3.3.1 The Environmental Management and Coordination (Amendment) Act (EMCA), 2015

Environmental Management and Co-ordination (Amendment) Act 2015, provides a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment. The initial EMCA which was enacted on the 14th of January 1999 commenced in January 2002. Topmost in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of the parts covering all aspects of the environment.

In relation to water resources, Section 42 of the Act deals specifically with the protection of rivers, lakes, seas and wetlands. The Act forbids interference with water bodies without the express permission from NEMA. The permission can be granted subject to the findings of an Environmental Impact Assessment.

The Act also empowers the Minister by the notice of Gazette to declare a lakeshore, wetland, coastal zone or riverbank as protected area and impose such restrictions, as he considers necessary to protect the lakeshore, wetland, coastal zone and riverbank from environmental degradation.

The Second Schedule to the Act specifies the projects for which an EIA and EA must be carried out. In this Schedule, the proposed project falls under High Risk projects section (5) Water resources and related infrastructure including (a) storage dams and barrages; (b) river diversions and water transfer between catchments; and (e) water abstraction works. According to section 58(2) all projects categorised as High Risk shall require submission of environmental impact assessment study reports. According to Section 68 of the Act, all projects listed in the Second Schedule of the Act must undertake an environmental audit, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require. The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out EIAs and EAs.

The main objectives of the Act are to:
- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for statutes that contain environmental provisions; and
- Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

This report has been compiled to comply with EMCA and the Environmental (Impact Assessment and Audit) Regulations, 2003. EMCA has provided for the development of several subsidiary legislations and guidelines that govern environmental management which are relevant to the proposed project. They are as analyzed in section 3.3.2 below.

3.3.2 Environmental Management Regulations

The Environmental (Impact Assessment and Audit) Regulations, 2003

The Environmental (Impact Assessment and Audit) Regulations, 2003 state in Regulation 3 that "the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act".

Regulation 4(1) further states that:
"…no Proponent shall implement a project:

a) likely to have a negative environmental impact; or
b) for which an environmental impact assessment is required under the Act or these Regulations, unless an environmental impact assessment has been concluded and approved in accordance with these Regulations…"

Water Quality Management Regulations, 2006 (Legal Notice No. 120)

These regulations were drawn under section 147 of the Environmental Management and Coordination Act 1999. In accordance with the regulations, every person shall rephrain from acts

that could directly or indirectly cause immediate or subsequent water pollution and no one should throw or cause to flow into water resources any materials such as to contaminate the water. The regulation also provides for protection of springs, streams and other water sources from pollution. This applies anytime there is a discharge of effluent into the environment without meeting the established standards. This requires an all-time compliance through the project cycle.

Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, 1999. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites. This will apply on disposal of solid waste into the environmental without complying with the established standards and procedures. Requires an all-time compliance.

Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. Part II Section 4 also states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Part III, Section 11(1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence. Section 13(1) states that no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding (a) machinery that may be used, and (b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations. It further states that the relevant lead agency shall ensure that mines and quarries where explosives and machinery used are located in designated areas and not less than two kilometres away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5

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

Air Quality Regulations

Under the general prohibitions (Part II), section 5 states that no person shall act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases (GHG). Odours are also prohibited under section 9 of the regulations (offensive emissions). Emissions into controlled areas such as schools, hospitals, residential areas and populated urban centres are also prohibited.

Part VII on occupational air quality limits in section 29 states that an occupier of premises shall ensure that exposure of indoor air pollutants does not exceed the limits stipulated under the Factories and Other Places of Work rules or under any other law. Other sources are recognized at sections 32 and 33 are those arising from construction equipment and materials as well as particulate matter from demolitions of structures and buildings as well as stockpiled dry materials.

Biodiversity Regulations

Part II of Regulations, section 4 states that no person shall engage in any activity that may have adverse impacts on ecosystems, lead to introduction of exotic species or lead to unsustainable use of natural resources without an EIA license. The regulation puts in place measures to control and regulate access and utilization of biological diversity that include among others banning and restricting access to threatened species for regeneration purposes. It also provides for protection of land, sea. Lake or river declared to be a protected natural environmental system in accordance to section 54 of EMCA, 1999.

3.3.3 The Water Act 2016

Part I section 3 states the purpose of the Act that it is to provide for the regulation, management and development of water resources and water and sewerage services in line with the Constitution. Part III section 11 establishes the Water Resources Authority which is mandated to among other things; regulate the management and use of water resources and receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits. Section 13 further gives the Authority powers to monitor compliance by water users with the conditions of permits and the requirements of the Act.

Section 21 of the Act refers to the development and maintenance of a National Monitoring and Information System which the Authority all the water resources are georeferenced and also gives the authority powers to request any person, within a reasonable time or on a regular basis, to provide it with specified information, documents, samples or materials in relation to the Monitoring and Information System.

Section 77 of the Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorized to take. Under the Act, the licensee could be a county government or a public limited liability company established under the Companies Act, 2015 or other body providing water services as may be approved by the Regulatory Board. Further, Section 78 gives the WSPs a responsibility for the provision of water services within the area specified in the licence and the development of county assets for water service provision. Section 91 gives the responsibility for the efficient and

economical provision of water services so as to fulfil the rights to water and any other conditions specified in the licence to the water services provider.

Section 81 of the Acts states that a registered WSP may with the approval of the relevant licensing authority extend water services to rural or developing areas.

Section 142 makes provision with respect to construction, extension or improvement of dams and the licensing of persons carrying on business as dam contractors.

3.3.4 Water Resources Management Rules, 2007

One of the outcomes of the water sector reforms has been improved regulatory framework for water resource management and use. In addition to the Water Act 2016, the main document outlining the regulations is the Water Resource Management Rules 2007. The rules set out the procedures for obtaining water use permits and the conditions placed on permit holders.

Other sections within the rules imply that Water Resources Authority (WRA) can impose water quality sampling requirements from the water sources and impacts to the hydrology, water chemistry and river morphology downstream basin. Section 16 of the Water Rules requires approval from the WRA for a variety of activities that affect the water resources, including the storage of water in dams and pans. Approval by WRA is conferred through a Water Permit. A permit is valid for five years and must be renewed. AWWDA will apply for authorization to construct works once the NEMA license is issued.

Section 104 of the Water Resource Management Rules requires certain water permit holders to pay water use charges. The intention of the water use charges was to raise revenue for water resource management, raise revenue for catchment conservation activities, improve efficiency of water resource abstraction and provide a system of data collection on water resource usage.

The rules sets the standard procedures and rules to be followed in the utilization of water resources including abstraction controls, modes of use and responsibilities in protection of the resources including effluent treatment standards.

3.3.5 The Wildlife Conservation and Management Act, 2013

This Act became operational on 10 January 2014. One of its guiding principles is the devolution of conservation and management of wildlife to landowners and managers in areas where wildlife occurs, through in particular the recognition of wildlife conservation as a form of land-use, better access to benefits from wildlife conservation, and adherence to the principles of sustainable utilization. Section 25 of the act provides for compensation for injuries and damages caused by wildlife (species listed in its third schedule) to humans and their properties respectively. Such compensation claims are to be reviewed and awarded by County Wildlife Conservation and Compensation Committees at the ruling market rates: provided that no compensation shall be paid where the owner of the livestock, crops or other property failed to take reasonable measures to protect the properties from damage by wildlife or land use practices are incompatible with the ecosystem-based management plan for the area.

The act in its sixth schedule list various animal and tree species that are nationally considered as critically endangered, vulnerable, nearly threatened and protected. It also lists in its seventh schedule, national invasive species for which control is required. Section 48 restricts activities involving the above listed species without a permit from KWS. KWS can make recommendations to the responsible cabinet secretary, to prohibit carrying out of any activity which: is of a nature

that may negatively impact on the survival of species listed in sixth schedule; or is specified in the notice or prohibit the carrying out of such activity without a permit issued by KWS.

Any critically endangered, vulnerable, nearly threatened or protected species found within the project area will have to be managed in line with this Act.

3.3.6 The Forest Conservation and Management Act, 2016

This Act makes provision for the conservation and management of public, community and private forests and areas of forest land that require special protection, defines the rights in forests and prescribes rules for the use of forest land. It also makes provision for community participation of forest lands by community forest association, the trade in forest products, the protection of indigenous forests and the protection of water resources.

The Act establishes the Kenya Forest Service as a body corporate and the Forest Conservation and Management Trust Fund. The Service shall, among other things: conserve, protect and manage all public forests in accordance with the provisions of this Act; prepare and implement management plans for all public forests and, where requested, assist in preparation of management plans for community forests or private forests in consultation with the relevant owners; receive applications for and issue licences and permits; establish and implement benefit sharing arrangements in accordance with the provisions of this Act; manage water catchment areas in relation to soil and water conservation among others.

The project will trigger this act as the proposed dam is within the Kinale Forest. A permit for the use of the forest has already been sought from the Chief Conservator of Forests as required by the act. A copy of the letter to KFS is attached.

3.3.7 Land Related Acts

i. The Land Act, 2012

This is an Act of Parliament intended to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. Parts 1 and 2 of section 4 of the Act outline the main guiding principles in land management and administration, binding to all land actors including state officers. These principles are to be applied when Enacting, applying or interpreting any provisions of this Act; and when making or implementing public policy decisions. The act vests management of land on National Land Commission (NLC).

Acquisition of Private Land for Public Use

Section 110(1) of the Act provides that land may be acquired compulsorily under this if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.

In such an acquisition, this Act, in section 111(1) provides that just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The procedure for land acquisition is laid out in Part VIII of the Act.

Provisions on Acquisition of wayleave

The Land Act, 2012 provides for mechanisms of wayleave acquisition either as public right of way or communal right of way. Section 143 of the act empowers NLC to create public rights of way. *A public right of way may be:* (a) *a right of way created for the benefit of the national or county*

government, a local authority, a public authority or any corporate body to enable all such institutions, organizations, authorities and bodies to carry out their functions, referred to in the Act as a wayleave; or (b) *a right of way created for the benefit of the public, referred to in section 145 of this Act as a communal right of way.*

A public right of way shall attach to and run with the servient land in respect of which it has been created and shall be binding on all owners from time to time of the servient land, any manner they are occupying the land, whether under a land or a derivative right thereof, or under customary law or as a successor in title to any such owner or as a trespasser.

Section 144 (1) states that an application, for the creation of a wayleave, shall be made by any State department, or the county government, or public authority or corporate body, to the NLC.

Subsection (5) requires NLC to publish the application along the route of the proposed wayleave calculated to bring the application clearly and in a comprehensible manner to the notice of all persons using land over which the proposed wayleave is likely to be created.

Section 145 (1) provides that a county government, an association, or any group of persons may make an application to the commission for a communal right of way. Once an application has been made to NLC, the determination for creation of a wayleave is conducted as per section 146 of the act.

An appeal against an order creating the wayleave is allowed within six weeks after the order has been made. Such appeal is made to the Court on a point of law against an order made by the Cabinet Secretary, but apart from such an appeal, an order of the Cabinet Secretary shall not be questioned by way of judicial review or otherwise in any court.

According to section 148, prompt compensation shall be payable (by the State Department, county government, public authority or corporate body that applied for the public right of way) to any person for the use of land, of which the person is in lawful or actual occupation, as a communal right of way and, with respect to a wayleave, in addition to any compensation for the use of land for any damage suffered in respect of trees crops and buildings as shall, in cases of private land, be based on the value of the land as determined by a qualified valuer.

In case of disagreement or dissatisfaction on amount or method of or time taken to make payment, the affected individual may apply to court for determination and award.

Section 148 (6) stipulates that NLC shall make regulations prescribing the criteria to be applied in the payment of compensation. However, these regulations have not yet been formulated.

ii. The National Land Commissions Act, 2012

This is an Act of Parliament to make further provision as to 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 mandate of the Commission, as provided for in the Act, Pursuant to Article 67(2) of the Constitution, shall be:

- To manage public land on behalf of the national and county governments;
- To recommend a national land policy to the national government;

- To advise the national government on a comprehensive programme for the registration of Title in land throughout Kenya;
- To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in land conflicts;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country
- On behalf of, and with the consent of the national and county governments, alienate public land;
- To monitor the registration of all rights and interests in land;
- To ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations;
- Develop and maintain an effective land information management system at national and county levels;
- Manage and administer all unregistered trust land and unregistered community land on behalf of the county government; and
- Develop and encourage alternative dispute resolution mechanisms in land dispute handling and management.

This Commission will be integral in the management of land issues arising from the project implementation, especially as far as the dam site and pipelines wayleave acquisition is concerned. A draft RAP report has been prepared and will be submitted to NLC for implementation.

iii. The Land Registration Act, Act No. 3 of 2012

This is an Act of Parliament intended to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes.

These provisions are essential to any new land acquisition or transaction processes arising from implementation of the water project.

iv. The Land and Environment Court Act, 2012

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.

Any land or/and environmental cases arising from the project will be handled in accordance with the provisions of this act.

3.3.8 Occupational Safety and Health Act, 2007

This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at work places to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. Section 3 (1) states *"that the Act shall apply to all workplaces where any person is at work, whether temporarily or permanently".*

The contractor and AWWDA will be required to comply with all the provisions of the Act throughout the project cycle. This will ensure that the employee safety is guaranteed at all times.

3.3.9 The Penal Code (Cap. 63)

Section 191 of the Penal Code makes it an offence for any person or institution that voluntarily corrupts, or foils water for public springs or reservoirs rendering it less fit for its ordinary use. Similarly, section 192 of the same act prohibits making the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along a public way.

The contractor and the project proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impacts associated with dust, noise and effluent discharge. This code is also applicable during the operation phase of the project.

3.3.10 Public Health Act (Cap 242)

Part IX, Section 115, of the Act states that *"no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health".* Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under Section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health.

The project construction and operation activities are bound to expose both workers and members of the general public to situations injurious to health. All activities of the project are thus expected to abide by this act to ensure a healthy environment.

3.3.11 The Physical and Land Use Planning Act, 2019

This is an act of Parliament to make provision for the planning, use, regulation and development of land and for connected purposes.

The act requires that an application for development permission be done before construction works begins. This also applies to easements and wayleaves. An application will be done to Kiambu County once the works contractor has been procured.

3.3.12 The County Governments Act 2012

The proponent will according to the County Government act of 2012 will ensure that the project activities conform to the regulation that shall be passed. Section 135 (1) states that the Cabinet Secretary may make regulations for the better carrying out of the purposes and provisions of this Act and such Regulations may be made in respect of all county governments and further units of decentralization generally or for any class of county governments and further units of decentralization) comply to the set regulations and by laws.

This is the primary law governing the development of counties and thereby will be key during implementation of the project. All organs established under this law should be consulted and approvals sought from the relevant authorities in relation to the County Government of Kiambu where the project falls.

3.3.13 Employment Act

This is an Act of parliament that applies to all employees employed by any employer under a contract of service. The Act came in operation in June 2008. Employment of children in the following forms is prohibited in the following sections of the Act:

53. (1) notwithstanding any provision of any written law, no person shall employ a child in any activity that constitutes worst form of child labour.
56. (1) No person shall employ a child who has not attained the age of thirteen years whether gainfully or otherwise in any undertaking.
(2) A child of between thirteen years of age and sixteen years of age may be employed to perform light work which is
(a) Not likely to be harmful to the child's health or development; and
(b) Not such as to prejudice the child's attendance at school, his participation in vocational orientation or training programmes approved by Minister or his capacity to benefit from the instructions received.

AWWDA and the contractor will need to understand the requirements of the Act during employment. Equal opportunity should be given to all both men and women so as to ensure equity.

3.3.14 Work Injury Benefits Act (WIBA)

It is an act of Parliament to provide for compensation to workers for injuries suffered in the course of their employment. It outlines the following:

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

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

3.4 Institutional Structure of the Water Sector

The National Policy on Water Resources Management and Development and the Water Act 2016, presently guides water resources management. The overall goal of the national water development policy is to facilitate the provision of water in sufficient quantity and quality and within a reasonable distance to meet all competing uses in a sustainable, rational and economical way. This policy separates policy formulation, regulation and services provision and defines clear roles for sector actors within a decentralized institutional framework and includes private sector participation and increased community development.

Under the policy, the Ministry in-charge of Water i.e. Ministry of Water, Sanitation and Irrigation is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses.

The following institutions have been established and their roles and responsibilities defined under the Water Act, 2016.

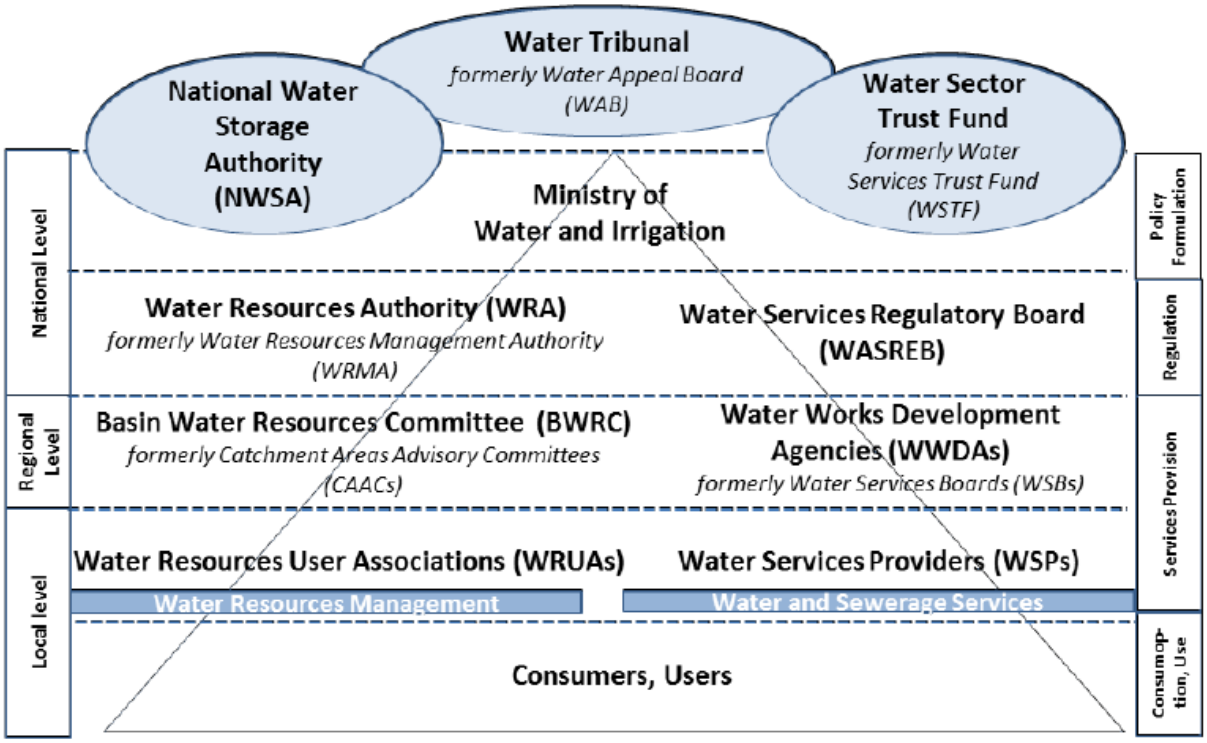


Figure 3.1: Water Act 2016 Institutional Framework

3.4.1 Water Services Regulatory Board (WASREB)

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

(i) Regulating the provision of water and sewerage services including licensing, quality assurance, and issuance of guidelines for tariffs, prices and disputes resolution.
(ii) Overseeing the implementation of policies and strategies relating to provision of water services licensing of Water Services Boards and approving their appointed Water Services Providers,
(iii) Monitoring the performance of the Water Services Boards and Water Services Providers,
(iv) Establish the procedure of customer complaints,
(v) Inform the public on the sector performance,
(vi) Gives advice to the Minister in charge of water affairs.

3.4.2 Water Resources Authority (WRA)

The authority is responsible for sustainable management of the Nations Water Resources;

(i) Implementation of policies and strategies relating to management of water resources,
(ii) Develop principles, guidelines and procedures for the allocation of water,
(iii) Development of Catchments level management strategies including appointment of catchments area advisory committees,
(iv) Regulate and protect water resources quality from adverse impacts,
(v) Classify, monitor and allocate water resources.

3.4.3 Water Services Trust Fund (WSTF)

This body assists in the financing of the provision of Water Services to areas of Kenya that are without adequate water services. This shall include providing financing support to improved water services towards;

(i) Capital investment to community water schemes in underserved areas
(ii) Capacity building activities and initiative among communities
(iii) Water services activities outlined in the Water Services Strategic Plan as prioritized by the Government
(iv) Awareness creation and information dissemination regarding community management of water services
(v) Active community participation in the management of water services

3.4.4 Water Works Development Agencies (WWDAs)

The WWDAs are responsible for the efficient and economical provision of water and sewerage infrastructure in their areas of jurisdiction. Athi Water Works Development Agency (AWWDA) is among the eight catchment Development Agencies established with the mandate to;

(i) Develop and rehabilitate water and sanitation infrastructure
(ii) Maintain water and sanitation assets for the Government
(iii) Monitor service provision
(iv) Sourcing of water and sewerage funding
(v) Assurance of water quality
(vi) Handle complaints and complements from clients and customers
(vii) Appointing and contracting Water Service Providers

3.4.5 Water Services Providers (WSPs)

Water Service Providers are the utilities or water companies. They are owned by the County Governments but have been commercialized to improve performance and run like business within a context of efficiency, operational and financial autonomy, accountability and strategic, but minor investment. The WSP that is set to benefit from increased customer base due to increase if revenue water will be Limuru Water and Sewerage Company (LIWASCO).

3.5 National Environment Management Authority (NEMA)

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

3.6 Sectoral Integration

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

Other stakeholder authorities/lead agencies include the Ministry of Water, Sanitation and Irrigation Ministry of Environment and Forestry, Ministry of Devolution and the ASALS, Ministry of Labour and Social Protection as well as the National Government Administration Officers (NGAO). Others are the Kiambu County Government and the Services Providers as well as key groups working with the beneficiary communities in the respective areas.

3.7 Project Management Institutional Structure

The proposed project management structure is proposed for the implementation of this project has the following components;

3.7.1 Contractor

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

3.7.2 Supervisor

The supervisor will be engaged by the proponent to ensure effective implementation of the environmental management plan. It is expected that the supervisor engages the services of an environmental expert who should in return understand the details of the recommendations on environment management and especially the proposed action plans, timeframes and expected targets of the management plan. The environmental supervisor expert should also be the liaison person between the contractor and the proponent on the implementation of environmental concerns as well as issues of social nature associated with the project.

3.7.3 AWWDA Environmental Management Unit

This is a unit established within the proponent framework to facilitate compliance of water and sanitation projects with appropriate environmental regulations. The officers under this unit are expected to continuously advise the projects implementing team on the environmental compliance and also to provide a direct liaison with NEMA. Reports on the project implementation should reach this office directly from the contractor and stakeholders or through the supervisor while on the other hand, NEMA and other environmental management stakeholders such KFS are expected to raise any environmental issues related to the project through the same office. The office, therefore, is expected to be well informed of all project related issues at all times during the implementation and operations.

Chapter 4: Environmental Setting

4.1 Location

Kiambu County is one of the 47 counties in the Republic of Kenya. It is located in the central region and covers a total area of 2,538.7 Km^2 with 476.3 Km^2 under forest cover according to the 2019 Kenya Population and Housing Census. Kiambu County borders Nairobi and Kajiado Counties to the South, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West as indicated in Figure 4.1. The county lies between latitudes 00 25'and 10 20'South of the Equator and Longitude 360 31'and 370 15'East.

Figure 4.1: Location of Kiambu County

The proposed Kinale dam will be located within Kinale location in Lari sub county. Other components such as the tanks and pipeline will be within Linuru Sub-County.

4.2 Administrative Setting

Administratively, the project – *Kinale Dam Water Project* will be implemented within the jurisdictions of one WSP in Kiambu county i.e. Limuru Water and Sewerage Company (LIWASCO) serving Limuru and Lari Sub-Counties.

4.3 Demographic Data

According to the 2019 Kenya Population and Housing Census, Kiambu County had a total population of 2,417,735 and 795,241 households. The average size of each household for the county was estimated at 3.0. The County's population for 2019 per sex distribution included some 1,187,146 males and 1,230,454 females while 135 were reported to be intersex, a sex criterion that was introduced for the first time in the history of census exercise in Kenya.

According to the 2019 population census, the population distribution for the wider project target area which include Lari and Limuru sub counties is presented in the following table:

Table 4.1: Population of the Project Target Area

Areas	Male	Female	Intersex	Total Population	No. of Households	Average Household Size	Population Density (Per sq.km
Lari	67,061	68,238	4	135,303	38,592	3.5	313
Limuru	79,632	79,682	-	159,314	49,174	3.2	559
Total	**146,693**	**147,920**	**4**	**294,617**	**87,766**	**6.7**	**872**

Source: 2019 Population Census (KNBS)

Settlement patterns in the area are dictated by several factors including rural-urban migration, well-developed infrastructure and close proximity to urban centres. Due to the high population density in most parts of the area, land has been fragmented into small pieces.

4.4 Physiographic and Natural Conditions

4.4.1 Physical & Topographic Features

Kiambu County is divided into four broad topographical zones viz, Upper Highland, Lower Highland, Upper Midland and Lower Midland Zone. The Upper Highland Zone is found in Lari Constituency and it is an extension of the Aberdare ranges that lies at an altitude of 1,800-2,550 metres above sea level. It is dominated by highly dissected ranges and it is very wet, steep and important as a water catchment area. The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, and Githunguri and Kabete constituencies. The area is characterized by hills, plateaus, and high-elevation plains. The area lies between 1,500-1,800 metres above sea level and is generally a tea and dairy zone though some activities like maize, horticultural crops and sheep farming are also practiced.

The upper midland zone lies between 1,300-1,500 metres above sea level and it covers mostly parts of Juja and other constituencies with the exception of Lari. The landscape comprises of volcanic middle level uplands. The lower midland zone partly covers Thika Town (Gatuanyaga),

Limuru and Kikuyu constituencies. The area lies between 1,200-1,360 metres above sea level. The soils in the midland zone are dissected and are easily eroded. Other physical features include steep slopes and valleys, which are unsuitable for cultivation. Some parts are also covered by forests.

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

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

4.4.2 Ecological Conditions

Water in the county is from two principal sources- surface and sub-surface. About 90 percent of the county‘s water resource comprises of both surface water resources and ground water potential. The county is divided into several sub-catchments areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi river sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two sub-catchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares range. Last one is Ewaso Kedong sub catchment wich runs in the North-South direction and occupies the western part of the county. It has several streams that normally form swamps.

4.4.3 Climatic Conditions

The upper reaches of the Gatamayu River subcatchment lies within the humid Agro-Climatic Zones of Kenya. The forest zone and the adjoining landform adjacent to the forested area including the proposed Kinale Dam, fall within the humid zone with fairly cool temperate climate with mean annual temperatures varying between 12^0C and 14^0C.

a) Rainfall

Rainfall in the Gatamayu River subcatchment and other regions in Kenya are affected by the movement of the Inter-Tropical Convergence Zone (ITCZ). In addition to the large-scale systems, there are regional factors which modify rainfall over most parts of Kenya. In the case of Gatamayu River subcatchment, the Aberdare Mountain Ranges play a major role in modifying the climate. The rainfall in the subcatchment displays a bimodal pattern with one peak occurring in April during the long rains season and the other peak occurring in November during the short rains season. The long-term mean monthly rainfall pattern in the upper Gatamayu River subcatchment is depicted in Table 4.2 and Figure 4.2, following analysis of rainfall recorded at Kereita/Kinale Forest Station No. 9036191. Overall, the upper Gatamayu River subcatchment receives a mean annual rainfall of about 1200mm.

Table 4.2: Kereita/Kinale Forest Station: Long-term mean monthly rainfall

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RF	63.6	63.2	104.0	259.6	211.1	65.8	54.7	31.1	35.5	104.7	144.7	71.5

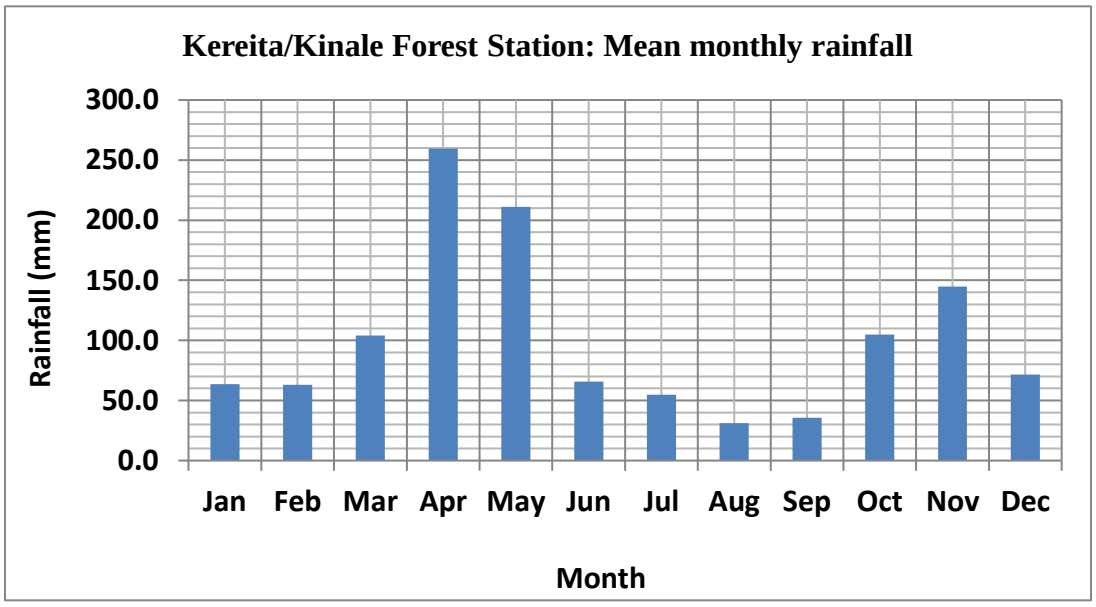


Figure 4.2: Kereita/Kinale Forest Station: Mean monthly rainfall

b) Temperature

With the exception of rainfall amounts, other climatological parameters are recorded at very few stations in the river basins within Kenya. Research has shown that temperature variations can be determined through empirical equations relating temperature to altitude. For Kinale Dam 1 catchment area, however, records from Kimakia Forest Station No. 9036233 have been analysed to show the temperature variations in the Upper Gatamayu River subcatchment. The analysed results are depicted in Table 4.3 and Figure 4.3. The analysis indicates that extreme temperatures in the subcatchment range between a maximum of 21^0 C and a minimum of 6.4^0 C.

Temperatures are highest during the dry months of January to March and lowest between June and August.

Table 4.3: Kimakia Forest Station: Mean monthly temperature variations

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Max	20.3	21	20.5	19.2	17.9	16.5	14.9	15.1	17.7	18.7	18.2	19.3
Mean	13.4	14.1	14.4	14.2	13.3	11.9	11	10.9	12.1	13.3	13.3	13.2
Mean Min	6.4	7.1	8.2	9.2	8.7	7.3	7	6.7	6.4	7.9	8.3	7

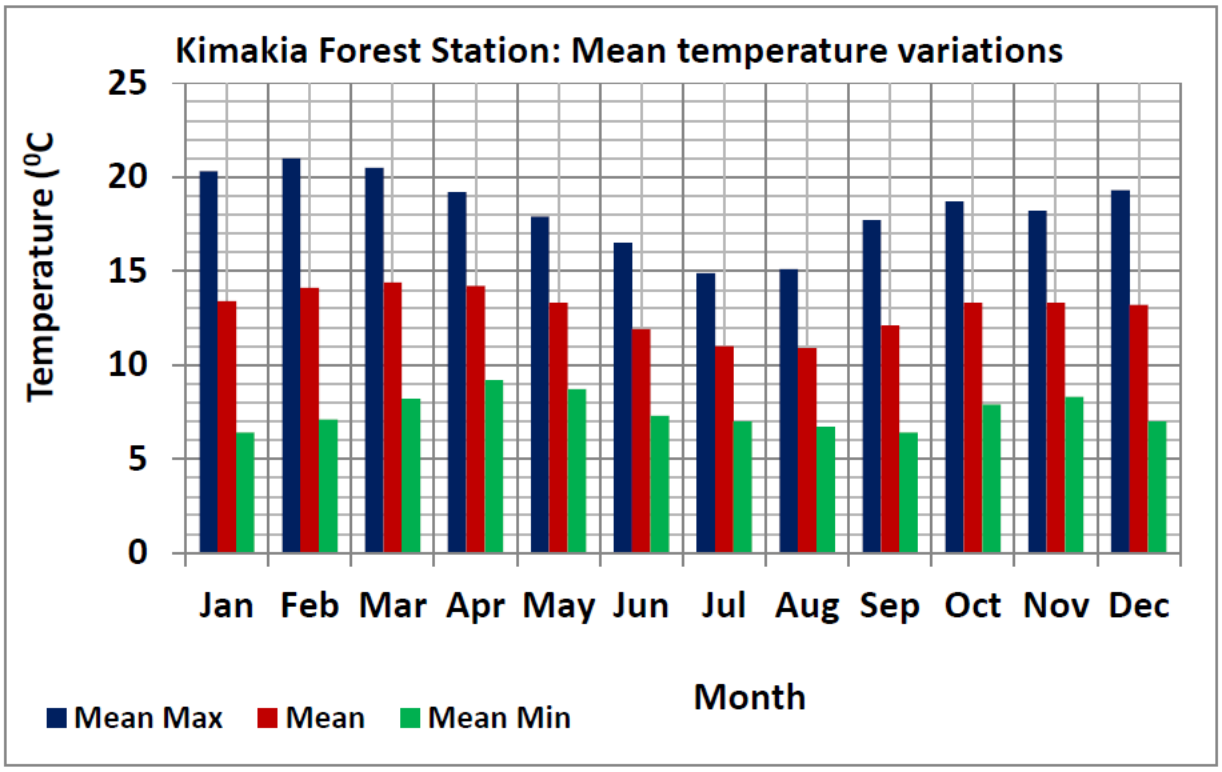


Figure 4.3: Kimakia Forest Station: Mean monthly temperature variations

c) Evaporation

Estimates of the rates of evaporation from open water surfaces have direct relevance to problems of economic importance for the country. Such evaporation data make an essential element in studies of crop water requirements; they are basic to catchment area research and management, and have considerable bearing on the feasibility of irrigation projects and water losses from storage structures.

However, there is lack of adequate instrumentation to measure the evaporation rates in Kenya. Accordingly, records observed at distant locations are used to give an estimate of the possible evaporation rates in a region.

For the upper Gatamayu River system, Kimakia Forest Station No. 9036233 has been selected to illustrate the evaporation variation in the region. The mean monthly evaporation for Kimakia station is shown in Table 4.4. The monthly evaporation rate results are graphically depicted in Figure 4.4.

Table 4.4: Kimakia Forest Station: Mean monthly evaporation

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Evaporation (mm)	127	124	139	120	101	75	50	56	94	114	103	112

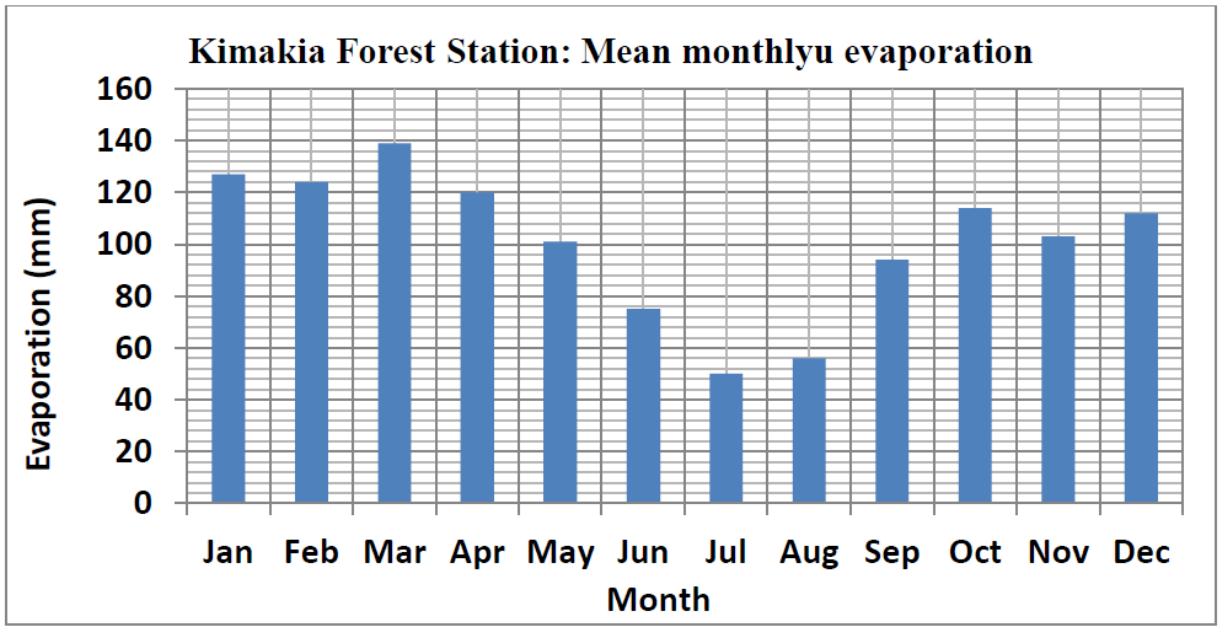


Figure 4.4: Kimakia Forest Station: Mean monthly evaporation

4.4.4 Details of River/Water body

The river under reference is Gatamayu River which is a tributary of Ruiru River. Gatamayu River rises on the south western highlands of the Aberdare Mountain Ranges at over 2600 masl and flows in a south by east direction through the Kikuyu Escarpment Forest, emerging from the forest on the eastern side near Gatamayu Rural Market Centre. The river continues on its south eastern flow direction to discharge into Ruiru River farther downstream.

However, the upper edges of the river in its upper sources within the Kinale/Kereita Forest zone were excised from the forest zone and allocated to the local community for settlement. Fortunately, the forest department is reclaiming most of the original forest land.

Gatamayu River system falls within the Ruiru drainage system identified as subcatchment 3BC. It has a number of tributaries originating within the forest and discharging into the main Gatamayu River within and outside the forest zone. These tributaries contribute most of the baseflow in the river system during the dry periods.

The Ruiru River system was formerly identified as subcatchment 3BC under the previous nomenclature of river basins by the Ministry of Water and Irrigation. Under the new water resources management arrangements, the subcatchment is combined with Thiririka River subcatchment to form the Ruiru River Management Unit in the Athi Water Catchment Management Strategy (Athi-CMS).

The location of the Ruiru Management Unit and the adjacent Nairobi River and Ndarugu River Management Units are depicted in Figure 4.5.

The Ruiru River Management Unit is classified as of high livelihood and commercial importance in the Athi River Catchment Management Strategy (ATHI-CMS).

Livelihood important management units are areas with predominantly rural characteristics i.e., rural and scattered settlements with varying population densities and where small-scale subsistence oriented economic activities dominate. This category of classification targets water resources management for equitable allocation and protection to ensure sustainable livelihood of the rural population. This is the situation pertaining to the upper reaches of Ruiru River and its tributaries.

Commercially important units are typically urban and/or industrial areas, including peripheral areas which can be developed as commercial centres. The management focus for these areas is to ensure quality of water resources to develop economic prosperity in the areas. This is the situation around Ruiru Town.

The main issues identified in the Ruiru River Management Unit including the Gatamayu River sub-catchment under the ATHI-CMS include:

- Pollution from agro-chemicals.
- Effluent discharges from rural market and urban centres,
- Water scarcity in relation to demand particularly during very low flows,
- Pollution emanating from runoff from unpaved road surfaces.

To ensure sustainable water resources management and development, the ATHI-CMS recommends a holistic approach in addressing these issues involving all relevant stakeholders.

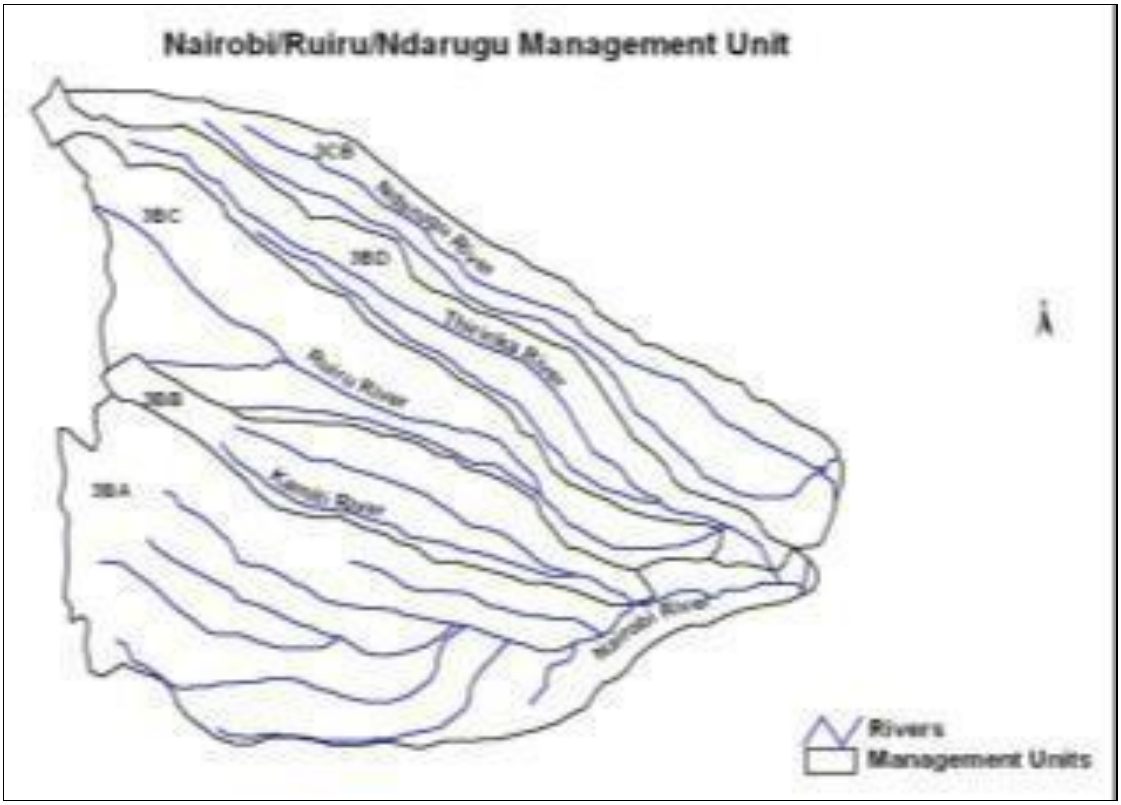


Figure 4.5: Schematic map of Ruiru River Management Unit

4.4.5 Drainage of the Area

A drainage basin is an extent or area of land where surface runoff from precipitation and melting snow/ice converge to a single point, usually the exit of the basin, where the waters join another water body, such as a river, lake, reservoir, estuary, wetland, sea, or ocean. The drainage basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels, and is separated from adjacent basins by a drainage divide.

The drainage of the project area is dominated the Aberdare Mountain Ranges which is the main water tower in the area. The drainage of Gatamayu River subcatchment is symptomatic of a dendritic system, where there are many contributing streams (analogous to the twigs of a tree), which are then joined together into the tributaries of the main river (the branches and the trunk of the tree, respectively). They develop where the river channel follows the slope of the terrain. Dendritic systems form in V-shaped valleys where the rock types are impervious.

The river is characterized by steep valleys in the upper forest zone and middle zones, which give way to gentle rolling plains as the river flows downstream in an easterly direction to discharge into Ruiru River.

The river originates from the Kikuyu Escarpment Forest (Aberdare Ranges) at an altitude of 2600 m.a.s.l. and flows in a south by east direction to emerge from the forest on the eastern side approximately 0.5 kilometre to the south of Gatamayu Rural Market Centre. The river discharges into Ruiru River about 2 kilometres to the south west of Komothai Market Centre. The topography of the upper reaches of the subcatchment comprises highly dissected ridge landforms with steep slopes of more than 10%.

In the characterization of stream patterns, Gatamayu River has a dendritic pattern, with small springs expanding to small streams, then to rivers that join the main trunk of Gatamayu River. From the stream pattern characterization, stream order classification is developed that reflect the degree of branching or bifurcation of the stream channels within the basin. In a channel network map of a basin, the smallest fingertip tributaries are given order 1. When two channels of order 1 join, a channel segment of order 2 is formed. When two channels of order 2 join, a channel segment of order 3 is formed, etc. A schematic map of this ordering is shown on Figure 4.6. The trunk of the stream through which all the discharge of water and sediment passes is therefore the stream segment of the highest order. Considering Gatamayu River at the proposed Kinale Dam Site 1, it is clear that Gatamayu River at this location comprise a channel segment of a very weak order 2. This is a narrow and elongated segment of the river system. Schematic map showing the stream pattern of upper Gatamayu River is shown in Figure 4.7.

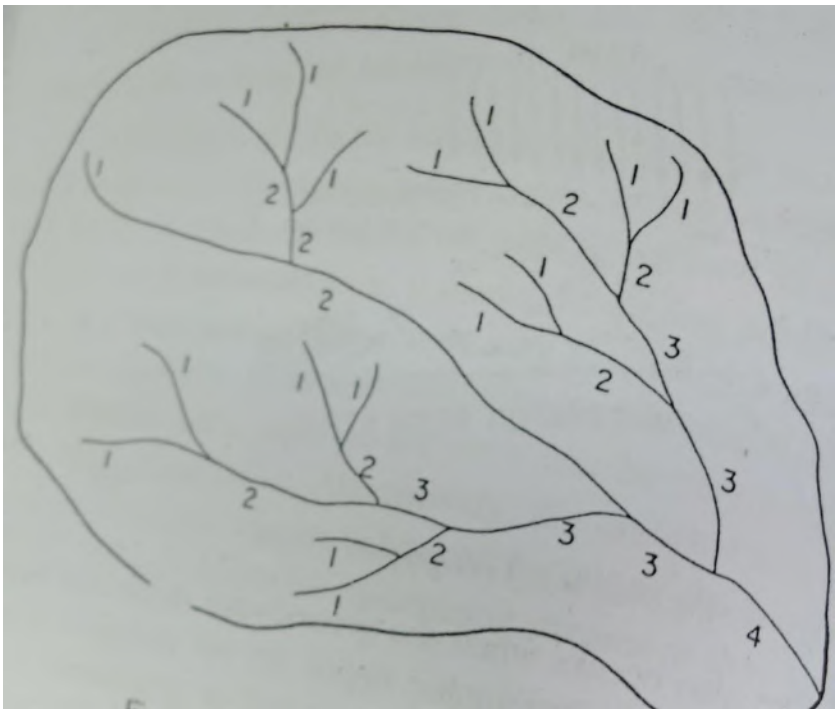


Figure 4.6: Stream ordering

Figure 4.7: Upper Gatamayu River profile

4.4.6 Geology and Soils

Geologically, the Gatamayu River subcatchment lies in the Middle Pleistocene to Pliocene geological zone with pyroclastic rocks, with intercalated Laikipian–type basalt. This is the dominant geological formation in Kiambu County and part of Murang'a County.

The soils in the Gatamayu River subcatchment comprise of mainly three types namely;

- Soils developed on pyroclastic rocks and are well drained, very deep, dark reddish brown to dark brown, very friable and smeary, silty clay loam, with a humic topsoil. These mollic andosols are found in the upper reaches of the subcatchment including the river sources upstream of Kinale Forest Station and the proposed dam location;
- Soils developed on olivine basalts and ashes of major older volcanoes, and are well drained, very deep, dark reddish brown to dark brown, very friable and smeary, clay loam to clay, with a thick, acid humic topsoil; in places shallow to moderately deep and rocky. These soils are found on mountains and major scarps with slopes exceeding 30%. These soils are found mainly in the existing forest;
- Soils developed on Tertiary basic igneous rocks that comprise olivine basalts, nepheline phonolites with inclusion of older basic tuffs. These soils of the plateau and upper level uplands which are adjacent to the mountainous soils and extending to downstream of the confluence of Gatamayu River and Ruiru River comprise basically two types in the subcatchment, namely;
    - In the upper reaches adjoining the Andosols of the mountain ranges, the soils are well drained, extremely deep, dark reddish brown to dark brown, friable and slightly smeary clay, with an acid humic topsoil.
    - In the lower reaches of the subcatchment including the supply area, the soils are well drained, extremely deep, dusky red to dark reddish brown, friable clay, with an acid humic topsoil. These soils are found on the eastern lower slopes of Aberdare Mountain Ranges where Gatamayu River discharges into Ruiru River.

4.5 Project Target Area

The project targets to cover the Western part of the County specifically Lari and Limuru Sub-Counties in Kiambu County. The elevation of most of the supply area lies below 2480masl. The project targets to supply water by gravity. Therefore, ideal site for the dam should enable water to be treated at elevation of or above 2480masl. Major towns within the supply area are Limuru, Kimende, Kwa mbira and Ndeiya. Limuru Town is at elevation of 2300 masl.

4.6 Existing Water Schemes in Limuru Sub-County

Limuru Water & Sewerage Co Limited (LIWASCO) currently operates one borehole in the project area. The project area has a borehole at Soko-Mjinga and one currently being constructed at Mirangi-ini School, which is closer to the project area.

About 30km from the project target area are 2 No. boreholes; these are Nguirobi with a production of about 30.0m³/hr. The other one is Thigio Boys' secondary school borehole with a production of about 6.0m³/hr. Two more boreholes exist in this area. These are Tutu and Gathima boreholes. The company has abandoned these boreholes. The reasons given are low production and high cost of operation and maintenance.

Bathi Water Supply is the only substantial water supply project in the supply area. The scheme is characterized with high operation and maintenance costs due to high cost of electricity. Within the proposed project area, the existing water supply infrastructure includes pipes and masonry storage tanks that formed part of original Bathi gravity scheme.

Constructed in the year 1977, the infrastructure has outlived its design life and the present status as follows;

- Masonry storage tanks are currently undersize, show signs of previous leakages
- UPVC gravity main supply pipes are currently undersize and exposed in most sections.

The gravity scheme served people mainly through communal water points. As such computation of water demand was done using low rates that are associated with non-individual connections. The Existing Bibirioni 45m^3 storage tanks (which had earlier been operated by Bibirioni water scheme, but has since been taken up by LIWASCO) supplies the neighbouring areas with limited water supply. A site nearby these tanks has been earmarked for construction of a 1250m^3 RC tank.

Two Existing 225m^3 tanks have been in operation albeit with heavy leakages. The Kibuthu tank located near Mutarakwa is located at chainage 7,000m and the other one is at chainage 10,200m of pipeline. Another 50m^3 Storage tank is located in chainage 20,300m of the pipeline adjacent to Limuru-Kikuyu boarder.

Due to the existing challenge of persisting lack of water in the area, community intervention is in the form of:

- Community resident in discrete areas that were part of the original Bathi scheme areas organizing themselves to take over management of water supplies within their respective areas. Such as Bibirioni water supply scheme.
- Water vending is a universal activity over are visibly evident over the entire Roromo borehole project area, with water resellers selling water as high as Kshs 40 per 20liter in Kamirithu sub location (Kshs 250 per drum of 6number 20liter cans).

Water buying business thus overstretches the economically active community's resident in the respective areas who does purchase water for all their domestic needs (livestock inclusive) from the water vendors.

According to the latest impact report, Issue No. 12/2020 Limuru Water and Sewerage Company which serves the two sub counties of Limuru and Lari has a serviceable population of 294,617 of which 146,927 people are served. This represents about 50% coverage. The coverage does not necessarily indicate adequacy of water supply. The production of Liwasco is 1,678,000 m^3/year which translates to 4,600 m^3/day.

4.7 Population projections and water demand

The population base year was chosen as 2019, which was when the last national population & housing census was undertaken. Using the average growth rate, the present population of 2020 was derived as was that of the Initial (2023), Future (2033) and Ultimate (2043) horizons, which was done at intervals of 3, 13 and 23 years respectively from the present period.

The following water demand parameters were employed for preliminary projections: -

- Average population Growth Rate was taken as 2.2% p.a. as derived intercensal from 2019 and 2019 census report.
- The consumption rate for the target area was taken as 60 l/h/d & 150 l/h/d as derived from the Ministry of Water & Irrigation - Practice Manual for Water Supply Services (2005). The scenario chosen was assuming an urban area with medium class housing.

- The whole of supply area is assumed to be rural area of High potential Consumption rate and Non-Revenue water assumed as 20%

Table 4.5: Population and Water Demand

KINALE DAM															
					Water Demand Parameters										
					Average Growth Rate										
					Years (n) from Census	1	3	13	23						
					Consumption (Rate l/c/d	60	(Rural Area With Middle Class Housing)								
Target Area Population Census							Present	Initial	Future	Ultimate	Total Water Demand M^3/d for Various Horizons				
2019							2020	2023	2033	2043	2019	2020	2023	2033	2043
Region	**Male**	**Female**	**Total**	**Households**		**Density**	**Pop.total**	**Pop.total**	**Pop.total**	**Pop.total**	**T.W.D**	**T.W.D**	**T.W.D**	**T.W.D**	**T.W.D**
Kikuyu	**90,919**	**96,198**	**187,122**	**60,668**		**1082**	**190,864**	**198,575**	**242,062**	**295,073**	**11,227.32**	**11,451.87**	**11,914.52**	**14,523.74**	**17,704.35**
Karai	23,302	23,276	46,578	13,567		480	47,510	49,429	60,254	73,449	2,794.68	2,850.57	2,965.74	3,615.22	4,406.93
akikuyu	44,713	47,128	91,844	29,226		1338	93,681	97,466	118,810	144,829	5,510.64	5,620.85	5,847.94	7,128.60	8,689.72
Kinoo	22,904	25,794	48,700	17,875		6807	49,674	51,681	62,999	76,795	2,922.00	2,980.44	3,100.85	3,779.92	4,607.70
Lari	**67,061**	**68,238**	**135,303**	**38,585**		**313**	**138,009**	**143,585**	**175,029**	**213,359**	**8,118.18**	**8,280.54**	**8,615.08**	**10,501.73**	**12,801.55**
Gatamaiyu	23,696	23,832	47,529	14,301		511	48,480	50,438	61,484	74,948	2,851.74	2,908.77	3,026.29	3,689.03	4,496.91
Kijabe	13,819	14,232	28,053	8,077		465	28,614	29,770	36,290	44,237	1,683.18	1,716.84	1,786.20	2,177.37	2,654.21
Kinale	14,194	14,503	28,698	7,409		585	29,272	30,455	37,124	45,254	1,721.88	1,756.32	1,827.27	2,227.44	2,715.23
Lari /Kinenga	15,352	15,671	31,023	8,798		388	31,643	32,922	40,132	48,920	1,861.38	1,898.61	1,975.31	2,407.89	2,935.21
Limuru	**79,632**	**79,683**	**159,314**	**49,096**		**559**	**162,500**	**169,065**	**206,090**	**251,222**	**9,558.84**	**9,750.02**	**10,143.92**	**12,365.38**	**15,073.33**
Limuru	32,542	33,218	65,760	19,978		1287	67,075	69,785	85,068	103,697	3,945.60	4,024.51	4,187.10	5,104.05	6,221.81
Ndeiya	15,474	15,346	30,819	8,216		243	31,435	32,705	39,868	48,598	1,849.14	1,886.12	1,962.32	2,392.06	2,915.91
Tigoni	31,616	31,119	62,735	20,902		586	63,990	66,575	81,154	98,927	3,764.10	3,839.38	3,994.49	4,869.26	5,935.61
TOTAL	**237,612**	**244,119**	**481,739**	**148,349**		**1,954**	**491,374**	**511,225**	**623,181**	**759,654**	**28,904**	**29,482**	**30,674**	**37,391**	**45,579**
			i)Add (Unaccounted for Water(20%))of the Total Demand								5,781	5,896	6,135	7,478	9,116
ii)Ultimate Total Water Demand											**34,685**	**35,379**	**36,808**	**44,869**	**54,695**

4.8 Overall Water Demand Requirements

The table below shows the water demand requirements for Limuru.

Table 4.6: Overall Water Demand Requirements

Summary				
Year	**Present year 2020**	**Initial year 2023**	**Future year 2033**	**Ultimate year 2043**
Limuru Water Demand (m^3/day)	21,636.67	22,510.79	27,440.53	33,449.86

4.9 Project Service Areas

It is proposed that the above proposed project be phased and implemented to primarily serve the areas of Limuru and Lari sub-counties. This is taken into consideration due to:

a) Neediness of project area

The percentage coverage of water services in the sub-counties of Lari and Limuru is significantly lower than that of Kikuyu sub-county at 50% coverage vis-à-vis 72% in Kikuyu. The residents of Limuru and Lari are therefore in greater need of water supply interventions. The above project therefore prioritizes the residents of Limuru and Lari for the proposed water development works.

b) Cost implications

The vast size of the project and its project components means that the cost implications are just as high. Due to limitations in project funding, it is best to implement the project in phases as below:

- Phase 1: Construction of the Kinale Dam, Raw and Treated Water Pipelines and Construction of a 4,000 m^3/day treatment plant
- Phase 2: Construction of the Thiririka Dam, Expansion of the existing treatment plant by 15,000m^3/day, Extension of Treated water pipelines to Kikuyu sub-county

4.10 Biological Setting

The Gatamayu River subcatchment lies within the humid to sub-humid agro-climatic zone classification in Kenya, and as such, the agricultural potential for the area is high. Extensive areas of these zones in central region of the country are under intensive small-scale agriculture where maize and beans are the main subsistence crops grown.

However, in the Gatamayu River subcatchment, the region is divided into three zones:

- The upper zone including parts of the river source, the area is settled by small-scale farmers who concentrate in the production of vegetables including, Irish potatoes, peas, cabbages, carrots, capsicum, etc;
- The middle zone is the virgin forest zone with no human activity;
- The lower zone and outside the existing forest zone on the eastern side, small-scale tea farms comprise the cash crop grown in the area. Livestock rearing is also an important economic undertaking with the farmers keeping one to three grade cows. In addition, growing of Napier grass for commercial purposes is undertaken by some farmers. Other activities include poultry keeping and piggery.

The project lies within the middle zone i.e forest zone within limited human activity. Due to the project being within Kinale Forest, AWDDA requested Kenya Forest Service to undertake an inventory of the forest vegetation to be affected. This was undertaken jointly from 21st to 25th September 2020. The total number of vegetation cover to be affected by the project is as shown in Table 4.7.

Table 4.7: Summary of vegetation to be affected by the project

Species	No. of stems
Dam	
Mixed Indigenous	12,064
Cup. lus	17
Pinus patula	160
Bamboo	8,676
Podo spp.	3
Acacia spp.	154
Sub-total	**21,074**
Raw water Pipeline Way leave	
Mixed Indigenous	4,212
Bamboo	24,391
Podo	30
Sub-total	**28,633**
Treatment Works	
Cup. Lus	411
Mixed indigenous	3
Sub-total	**414**
Treated Water Pipeline Way leave	
Mixed Indigenous	1,552
Cup. lus	1,270
P.pat	71
E. saligna	110
Juniperous procera	39
Bamboo	10
Sub-total	
Total	**53,173**

Chapter 5: Public Consultations

5.1 Background

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans.

Stakeholder consultative meetings for the Kinale Dam Water Project took place during the scoping studies and ESIA Study Phase. The main objective for the consultation process was to involve the stakeholders at the very early stages so as to get their opinion on the proposed project, identify likely negative impacts and find ways to minimise negative impacts and enhance positive impacts of the project.

5.2 Objectives of the Public Consultations

The overall goal of the consultation process is to disseminate project information and to incorporate the views of the project beneficiaries and Project Affected Persons (PAPs) in the design of the mitigation measures and a management plan.

The specific aims of the consultation process are to:

- Improve project design and, thereby, minimize conflicts and delays in implementation;
- Increase long term project sustainability and ownership; and
- Reduce problems of institutional coordination.

5.3 Stakeholder consultations

During the scoping studies and Full ESIA studies a number of stakeholders were consulted including:

i. Kenya Forest Service (KFS);
ii. Water Resource Users Associations (WRUA) for Thiririka and Gatamayu sub-catchments;
iii. National Government Administration Officers for Lari and Limuru Sub-Counties;
iv. The local communities within Lari and Limuru Sub-counties; and
v. Project Affected Persons.

The stakeholders were in support of the project and called for collaborative approach during the implementation of the project.

The comments from these stakeholders are as presented below.

5.3.1 Meeting with KFS

A meeting was held at KFS offices in Kinale on 21 September 2020. In attendance were KFS and AWWDA officials. The following were discussed in the meeting.

a) The forest cover (about 50 Ha) will be lost due to cutting of trees to pave way for the construction of the dam. In order to mitigate this, KFS and AWWDA will undertake to rehabilitate sections of the forest that are degraded. It was agreed that a joint field survey to be carried out by both the AWWDA team and the KFS official so as to have the reservoir limits pegged to facilitate the forest inventory process.
b) There was evidence of Plantation Establishment and Livelihood Improvement Scheme (PELIS) system taking place whereby the KFS allows communities living adjacent to the forest, through community forest associations (CFOs) the right to cultivate agricultural crops during the early stages of forest plantation establishment. Some of these communities will be affected and will need notice to vacate the area once construction commences; and

c) KFS noted that AWWDA should consider rehabilitating sections of the forest that are de-graded at 2X the total area that will be taken by the proposed Kinale Dam Water Project. It was advised that there should be sufficient allocation of funds for the conservation activities.

The minutes of meeting with KFS and attendance sheet is appended in Appendix 1.

5.3.2 Meeting with Water Resource Users Association

A reconnaissance of the area to be taken by the forest was undertaken with officials of Water Resource Users Associations (WRUA) for Thiririka and Gatamayu sub-catchments. The officials noted that there has been increased degradation of the catchment due to settlement and human activities upstream of the proposed dam area. Strategies for conservation of the catchment should be prioritized.

5.3.3 Meeting with the National Government Administration Officers

A meeting with the National Government Administration Officers of Lari and Limuru sub counties was undertaken on 10th November 2020. In attendance were the Assistant County Commissioners and area chiefs. The officials appreciated the project and pledged their support for the project.

It was noted that

- The water levels within Gatamayu rivers has been on the decline due to the destruction of the various springs which act as the main sources of water for Gatamayu River. This needs to be conserved.
- The conservation areas adjacent to the forest has also been alienated and title deeds issued. There is therefore need to degazette the area and conservation activities undertaken.
- Community water supply projects should be considered to serve the communities neighboring the proposed dam site;
- It was agreed that two public meeting will be held to sensitize the communities on 19th and 26th November respectively.

The attendance sheet is appended in Appendix 2.

AWWDA officials together with the Chief, Kinale location undertook reconnaise survey of the settlement areas that will be affected by the reservoir. It was noted that about 50 households will be affected.


Figure 5.1: Reconnaissance visit of the affected settlement area

5.4 Site visit by the Ministry of Water, Sanitation and Irrigation and Kiambu County Government

A site visit was made to the proposed Kinale Dam site by officials from Ministry of Water, Sanitation and Irrigation and Kiambu County Government on 1 July 2020. In attendance were:

- Principal Secretary, Ministry of Water, Sanitation and Irrigation;
- Governor, Kiambu County Government;
- CEC in charge of Water, Environment and Natural Resources, Kiambu County Government;
- Chairman and Directors of Athi Water Works Development Agency;
- CEO and managers of Athi Water Works Development Agency; and
- Managing Director, Limuru Water and Sewerage Company among others

During the visit it was noted that the construction of Kinale Dam will complement the supply of water from the Bathi Dam whose augmented water treatment plant handles a daily capacity of 4,000m^3/day of water day across its 12 kms water distribution pipelines. These two dams are part of our greater goal to improve water harvesting and storage and to ensure that the country attain over 1,000 litres per capita water availability in line the international standards.

Upon completion the project will have a storage capacity of 200,000m^3 with a water treatment plant with a capacity of 47,000m^3 per day with120kms of water pipeline.

Figure 5.2: Site visit to Kinale Dam by National and County Government Officials

The areas set to benefit are Bibirioni, Githunguri, Karanjee Misri, Kwa Mbira, Lari, Loromo, Ndeiya, Nderu, Uplands, Kijabe, Thigio and Limuru industrial area.

5.5 Visit by KFS's Chief Conservator of Forest

The Chief Conservator of Forests (CCF), Mr. Julius Kamau visited the proposed Kinale Dam site on 23 September 2020 to appreciate the site for the dam. He held discussions with AWWDA and KFS officials on the ground who were undertaking survey works and tree assessment. He noted that the project is beneficial as it will ensure adequate drinking water to the communities. However, he stressed the fact that the forest cover should be protected and minimal trees should be destroyed where possible. He emphasized evaluating the opportunity costs that KFS will have to foregone for the dam to be constructed and that this should be quantified in economic terms.

Figure 5.3: The CCF with AWWDA and KFS officials at Kinale Dam Site

5.6 Public Sensitization

Public sensitization and inclusion meetings wre held within the project area during the Full ESIA stage. The meetings will be held with the community at large and with the project affected persons. The meetings were held as follows:

Table 5.1: Public consultation meetings during ESIA

	Date	Venue	Location
1.	19/11/2020	Kwa Wangunja Grounds	Kinale
2.	26/11/2020	Proposed Dam Site Area (Kaguongo Village)	Kinale

Presented below are the main concerns and issues that arouse from the public meetings:

Table 5.2: Summary of discussions during public meetings

No.	Issue/Question	Comment/Response
Meeting at Kwa Wangunja Grounds		
1.	Will compensation for trees within the conservation area be carried out	An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.
2.	Will they be allowed to retain trees that were valued and compensated	The PAPs were informed that they could retain the compensated assets.
3.	The proposed dam would cut access to parcels of land which extent to both sides of the ridge	In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.
4.	What is the extent of the dam	The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.
5.	The dam poses as a security risk to the residents of the area especially children, what measures will be taken	Upon completion of the construction works for the dam, the implementing agency will permanently fence off the dam area. There will be restricted access to the dam
6.	Will there be employment opportunities for the community	Once the construction works commence, the community will be prioritized with regards to employment opportunities available
7.	What is the required distance for the buffer zone	The proposed project will consider a buffer zone of 30m
8.	In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider	If the land is greatly affected, full acquisition will be carried out for the parcels.
9.	Who will carry out the land acquisition for the project	AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project
10.	What measures are in place to address the micro-climate change that will be caused by the dam	The PAPs were informed the proposed dam will not have a significant change in the micro-climate conditions in the area.
11.	Will the residents/landowners around the dam be served by the dam?	The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing

No.	Issue/Question	Comment/Response
		boreholes would be done to boost the quantity of water further.
Meeting at the Proposed Dam Site Area (Kaguongo Village)		
12.	Who will carry out the land acquisition for the project?	AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project
13.	What rates will be adopted for compensation of any assets	The meeting was informed that the valuer would adopt the current market rates for items valued which will be further subjected to review by NLC who are the mandated body to carry out compulsory acquisition.
14.	Will compensation for trees within the conservation area be carried out	An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.
15.	Will they be allowed to retain trees that were valued and compensated	The PAPs were informed that they could retain the compensated assets.
16.	The proposed dam would cut access to parcels of land which extent to both sides of the ridge	In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.
17.	What is the extent of the dam	The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.
18.	In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider	If the land is greatly affected, full acquisition will be carried out for the parcels.
19.	Will the residents/landowners around the dam be served by the dam?	The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing boreholes would be done to boost the quantity of water further.

The attendance lists and minutes of meetings are presented in Appendix 3.

Figure 5.4: Public consultation meeting with PAPs at Kwa Wangunja Grounds

Figure 5.5: Public consultation meeting with PAPs at Kaguongo Village

Chapter 6: Impacts and Mitigation Measures

6.1 Impacts Overview

The proposed Kinale Dam Water Project has an overall benefit to the targeted communities within Kiambu County towards social and economic development of the county. In addition to the direct benefits to the communities, direct benefits will also be felt in the outlying counties of Nairobi whose wellbeing is all intertwined and are reported in other studies to be facing challenging water, sanitation and hygienic conditions. Increased water into these zones is a desired achievement in reducing health risks especially in water borne diseases including typhoid, Diarrhoea, skin diseases eye infections and now the emerging Corona Virus 2019 pandemic.

Finally, the Kinale Dam water project will contribute towards fulfilling part of the Master Plan for Developing New Water Sources for Nairobi and Satellite Towns. The works location are largely on public land (forest reserve and road reserves) which greatly reduces the cost of project implementation and major impact is the loss of the associated vegetation, surface soil disruption, and limited local drainage disruption. At the social front, there is no direct disruption of the social setting but concerns on social benefits including connections of treated water which cannot be ignored.

6.2 Positive Impacts

The specific positive impacts arising from the project include the following;

6.2.1 Construction Phase

(i) There are potential employment opportunities to the local communities, especially for casual labour,
(ii) Selected materials supply from the local business people,
(iii) Benefit of skills development potential for alternative livelihood by the people who will be employed by the project.

6.2.2 Operations

(i) Increased access to piped water whether piped into a dwelling or into yard/plot.
(ii) There is perhaps a value addition on the land consented for the masonry water storage tank works construction.
(iii) Long term benefits to the target communities within Kiambu County and the nearby counties including reduced incidences of water borne diseases.
(iv) Increased revenue base to the respective Water Service Providers
(v) Better preparedness in the fight against the emerging Corona Virus 2019 pandemic especially in the access to water for washing of hands.

6.3 Construction Impacts and Corrective Measures

6.3.1 Loss of Vegetation

(i) Removal of trees, shrubs and grass to pave way for the dam construction, treatment plant, tanks and laying of pipeline leaves the land bear,
(ii) Lost vegetation exposes soil to erosion (wind and surface runoff),
(iii) The trees especially the indigenous have an economic and social value lost upon removal.

Mitigation Measures

- *Compensate KFS for the loss of the forest materials at the dam area and its associated infrastructure,*
- *Provide sufficient budget for the restoration of the project sites that will be affected by the project,*
- *Support rehabilitation of the 100ha of the degraded forest areas in Kijabe forest block,*

- *Support renovation of staff houses at the Kinale Forest Station and Kereita forest stations,*
- *AWWDA, KFS and the County Government of Kiambu to identify areas for re-afforestation to offset the biodiversity loss at dam site.*

6.3.2 Soil Loss

(i) Excavation for the construction structures to generate spoil (overburden) which will be disposed outside the project site or on areas within the forest that are in need or rehabilitation due to landslides or degradation,

(ii) Potential disruption of surface drainage may lead to soil loss on alternative drainage channels,

(iii) Increased movement of vehicles (trucks) on site access roads may lead to enhanced soil loss.

Mitigation measures

- *Excavated soil should be used to the extent possible within the site for rehabilitation of degraded areas, landscaping and/or reclamation as a soil loss avoidance action,*
- *Provide a drainage plan for the site as part of the project implementation. Where alternative drains is required, ensure protection of soil therein,*
- *Landscaping during construction and introduce ground cover including grass for soil protection.*

6.3.3 Siltation of Water Sources

(i) Siltation of low lying wet areas from the construction excavations, surface drains and road surfaces.

(ii) Potential contaminated silt from camp site, workshop and track parking into the wet areas

Mitigation measures

- *Protect the low water holding wet areas from siltation by creating silt traps on the surface drains,*
- *Do not interfere with the vegetation cover around the wet areas.*

6.3.4 Air Pollution

(i) Potential dust emission from the earth works and truck movements.

(ii) Emissions from construction equipment (earth movers, power generators, trucks, e.tc.)

(iii) Open air burning of material including wastes

Mitigation measures

- *Earth works to always be done under dump conditions to avoid dusty conditions*
- *Ensure construction equipment are maintained to avoid emission generation.*
- *Burning of materials should be controlled.*
- *Dry plant matter be composted.*

6.3.5 Surface Drainage

(i) Position of the works components and the excavation thereof may interfere with the orientation of surface drainage of the project site and the receiving local basins,

(ii) Realignment of surface drainage may lead to soil loss on routes,

(iii) Creation of new hard surface may lead to addition surface runoff and hence demand for large capacity surface drains. It may also lead to enhanced soil loss.

Mitigation measures

- *Integrate local drainage with new natural slopes orientation to harmonise with upstream and downstream drains settings*

- *Any realignment should take into consideration downstream local land surface features to avoid soil erosion*
- *Direct surface runoff to appropriately sized surface drains internally and external.*

6.3.6 Impacts on Hydrology

Impact on hydrology of Gatamaiyu River is dependent on the design specification, purpose of the dam and the dam operation requirements. Dam construction works will;

(i) Temporarily Interrupt the river flow regime with consequence of change in the river stream flow patterns downstream,
(ii) Silt loading of downstream riverbed from excavations works with potential changes in the river discharge,
(iii) Reduce average high water levels downstream the basin,
(iv) Potential river water abstraction for construction use,
(v) Potential alteration of the local drainage system through obstruction and earth moving activities during the construction.

Mitigation Measures

- *Ensuring compliance with water resource regulations at all times,*
- *Reactivating gauging stations around the dam and downstream to monitor effects of the dam to the river basin over time,*
- *Ensure diversions of the river during construction has limited effects to the downstream river flow,*
- *Appropriate silt control at the construction areas to avoid siltation of the river downstream,*
- *Use of manual labor as compared to machinery along the riverbanks to the extent possible.*

6.3.7 Noise and Vibration

Main source of noise in the generally quiet environment will be the construction equipment (earth movers) and the tracks accessing the site. Others may include the workers and the construction activities (welding, cutting, metals hammering etc.)

Mitigation measures

- *Utilize low noise equipment to the extent possible,*
- *Construction works to be undertaken by day time to the extent possible. Noisy work to be undertaken during the day,*
- *Personal Protective Equipment be provided to all construction workers and application enforced.*

6.3.8 Waste Management

(i) Spoil disposal from the excavations may be a nuisance at destination points to the neighbouring land uses or ecological features
(ii) Construction debris and refuse may create a nuisance at the site and /or disposal destinations
(iii) Hazardous materials including used oil and related materials like oil filters, etc. could be a risk to the workers, neighbouring communities as well as the ecosystems
(iv) Plant matter if accumulated could be breeding areas for mosquitoes, pests and snakes.

Mitigation Measures

- *Provide appropriate approvals and plans for spoil disposal where necessary. It would be preferred if the spoil is dumped on areas where it can be reclaimed*
- *Construction wastes (debris, scrap metals, timber and plastics) should be recycled to the extent possible*
- *External disposal of the solid wastes should be on approved sites*

6.3.9 Ecological Disruption

Dams contribute to alteration of the aquatic and terrestrial habitat hence an effect on the species populations. Impacts on the river ecology can be impacted by changes to its flow which may reduce habitat for aquatic vegetation, organisms as well as bird's species. Effects of construction can also have a negative impact on the riverine ecosystem through depletion of nutrients.

Earthworks and land fragmentation during construction activities will contribute to terrestrial flora disruption through total vegetation removal. The entire terrestrial habitat will be disturbed permanently because the project area will be covered with water. The reservoir will affect the forest cover and the productive agricultural land hence affecting the general biodiversity.

Specific anticipated impacts include the following;

Aquatic Flora and Fauna

(i) New species of aquatic plants may get introduced into the project areas as a result of water stagnation.

(ii) With population characteristics changing, residents may introduce what may seem ornamental to them in their homes and subsequently through cuttings into Kinale dam and other surface water bodies in the area. Among such plants include the Water hyacinth and water cabbage (already major problems in Lake Naivasha, Lake Victoria, Lake Nakuru, Athi River and Tana River downstream).

(iii) At the moment, there is no significant aquatic wildlife presence reported in the project area. The influence of water may attract some limited animals into the area (limitation arises from the altitude conditions, temperatures and rainfall intensity). Among the animals anticipated into Kinale dam may include hippos, crocodiles and some snake species.

(iv) Areas under inundation following the weirs construction may over time be breeding ground for fish and other aquatic animals, further the area might attract other wild animals who would come looking for water.

Terrestrial Flora and Fauna

While appreciating that the dam construction will remove a significant biomass volume from the target location, introduction of the new terrestrial plant species is not anticipated. For purposes of the catchment conservation and compensation for the lost biomass, it is highly likely that this will involve the existing tree species in the area. An important loss of tree will appear during the Dam reservoir site clearance.

Figure 6.1: Typical terrestrial flora at the proposed dam site

This forest has a rich avifauna, characteristic of the central Kenyan highlands, the mammal *Loxodonta Africana*-elephants is present in good numbers and three near-endemic butterflies occur, namely *Charaxes nandina, Neptis kikuyuensis* and *N. katama*.

Mitigation measures

- *Removal of trees only where necessary to avoid disruption of birds nesting,*
- *Protect to the extent possible the low lying wet areas from siltation and pollutant,*
- *The integrity of the fence around the forest reserve must be maintained and relocated if possible in order to keep wild animals within the reserve,*
- *A detailed analysis of the biodiversity of Kinale dam ecosystem and specifically the specific project location will need to be undertaken,*
- *Creation of awareness on the proper land cultivation practices to reduce soil erosion and biomass accumulation in the dam reservoir,*
- *AWWDA will engage the relevant authorities (KFS, KWS) in monitoring and establishing community interests and values in the new ecological setting associated with Kinale dam,*
- *Education, awareness and sensitization programmes will be prepared for the local communities with respect to biodiversity management, values and their roles in the conservation.*

6.3.10 Health and Safety

(i) Risks to the workers from slips, trips and fall hazards
(ii) Falling objects during construction
(iii) Driver safety risks (especially trucks)
(iv) Risk of contracting and spread of Corona Virus 2019 (Covid-19)
(v) Hearing impairment from excessive noise
(vi) Sight problems associated with dust emission and other work related stress.
(vii) Public safety from accessing trucks and access to the construction site.

Mitigation measures

- *All workers should be provided with appropriate safety gear and ensure application all times,*
- *The contractor should ensure "driver safety "measures at all times e.g. safety gear, good driving conduct and truck maintenance,*
- *Provide good drinking water for the construction workers, acceptable sanitation and hygiene facilities and eating sheds,*
- *All personnel accessing the site must adhere to the Corona Virus 2019 directives and screening for body temperature to be instituted,*
- *Ensure safe and healthy work environment for the construction workers including noise level, dust level, safe movement corridors and access to medical services when required,*
- *The public should be kept off the construction site for their safety,*
- *Safety signage, information and barriers to be provided at appropriate locations,*
- *Fully stocked first aid kits to be available on sites and first aid training provided to selected workers.*

6.3.11 Sanitation and Hygiene

(i) The proposed site has no direct link to sanitation facilities (no toilets) risking dignity and health of the construction workers.
(ii) Lack of sanitation facilities risks the surrounding environment and community health
(iii) Potential conflicts with waste management and people's health (environmental contamination).
(iv) Lack of clean drinking and washing water for the construction site

Mitigation Measures

- *Provide mobile toilets and/or suitable pit latrines at the construction site and ensure maintenance and cleanliness,*
- *Provide clean drinking water for the workers,*
- *Ensure safe waste management during construction for the health of the workers.*

6.3.12 Potential Cultural Disruptions

There are no physical cultural and historical sites within the proposed project locations. However, immigrants with diverse cultures especially due to labour influx of the skilled labour into the area will also expose the area to different cultures in the area that is mainly inhabited by members of the Kikuyu community.

Mitigation Measures

- *The contractor should sensitize all staff on local cultures and discuss with local community on the same.*

6.3.13 Impacts on Livestock Farming

(i) There are traditional pasturelands and community watering points at the dam site that will be disrupted during construction,
(ii) Potential accidents for livestock and herders at the construction site.

Mitigation Measures

- *A safe and easy public access to the water should be provided for the community livestock,*
- *Fence off the reservoir and dam area to alleviate livestock drowning in the reservoir,*
- *Engage with KWS to deal with any emergent wildlife with risks to livestock.*

6.3.14 Impact on PELIS

There was evidence of Plantation Establishment and Livelihood Improvement Scheme (PELIS) system taking place whereby the KFS allows communities living adjacent to the forest, through community forest associations (CFOs) the right to cultivate agricultural crops during the early stages of forest plantation establishment. Some of these communities will be affected by the onstruction of the dam by losing their source of livelihood.

Mitigation measures

- *The farmers should be given notice to vacate once construction commences,*
- *The farmers to be allocated alternative sections within the forest.*

6.3.15 Land Acquisition Requirement

The Construction of the proposed Kinale Dam Water Supply Project will inevitably lead to physical displacement and/or economic displacement of some assets and livelihood triggering development and implementation of a Resettlement Action Plan (RAP).

An assessment of land requirement and affected households was carried out during the ESIA study phase and it was noted that the proposed dam footprint is situated within the forest and asset Inventory of affected trees within the forest is has been carried out by KFS. However, the dam reservoir stretches out to the settlement area beyond the forest within Kaguongo Village in Kinale Location.

Detailed inventory of the affected assets was therefore undertaken by a land economist in December 2020 and identified 80No households who will be affected by the project. These affected persons are mainly carrying out farming activities within the identified area therefore no physical relocation. The anticipated cost for the implementation of the RAP is **Kshs. 17,485,354.40**

Mitigation measures

- *A Resettlement Action Plan to be implanted with the assistance of National Land Commission.*

6.4 Operation Impacts and Corrective Measures

6.4.1 Impacts on Downstream Users

Kinale dam will have accumulative effect of regulation of flow downstream by balancing the peak flow during rainfall and the lowest during the dry conditions. However, farmers on the river flood plain will not receive the usual nutrient loads from flood flows since sediments and silt will be retained in the dam until the time of scouring (flushing). Productivity will, therefore, go down.

All activities depending on river flow could be affected by the reduction of flow, especially low flow. Moreover, riparian habitats, aquatic fauna and flora could be affected.

Mitigation measures

- *Ensure the compensation flows set for the dam are adhered to,*
- *Define and implement a monitoring plan for the Gatamaiyu River with respect to inflow rates, silt levels and water quality trends over a duration of time.*
- *All natural drains in the catchment areas be delineated for management and protection to reduce entry of silt and pollutants into the dams. Protection may include soil erosion control measures, vegetation enhancement and introduction of silt traps at farm levels.*

6.4.2 Dam safety

At 22m high, the proposed dam is a Large Dam that is subject dam safety considerations during the construction and post-construction phases covering;

i. Dam Safety under construction
ii. Dam Safety under operation
iii. Dam flooding process
iv. Dam break risks

Mitigation measures

- *Adequate diversion of the river and protection of the site during construction,*
- *Prepare relevant plans (Plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan,*
- *Prepare an emergency preparedness plan,*
- *Design and install metrological sensors and alarm during the construction to alert workers in case of risk of flood,*
- *Ensure use of high quality standard materials during construction phase.*

6.4.3 Waste Management

(i) Potential environment pollution from waste disposal including garbage from office wastes, dry vegetation matter and repair and maintenance wastes.
(ii) Nuisance from disposal of silt arising from de-siltation after some period of operation
(iii) Potential environmental pollution resulting from site camps that remain abandoned after works completion.

Mitigation Measures

- *Provide a solid waste holding shed with separate units for garbage and recyclable materials, to back this, provide solid waste bins at points of waste generation (offices, public areas etc.)*
- *All silt to be disposed of as land fill or reclamation and in accordance to Waste Disposal Requirements*
- *Provide for adequate sanitation within operational and maintenance facilities including septic tanks, soak pits and if necessary pit latrines.*
- *Ensure compliance with the waste management Regulation*
- *Engage appropriate waste handlers approved by NEMA for off-site handling of solid wastes,*
- *Consider a burning chute for dry matter including paper, timber, etc. plastics be recycled and disposed of in designated areas.*

6.4.4 Wastage of Water

(i) There is potential for a perception of “water is plenty” for the community leading to misuse (loose taps, over-watering gardens, washings etc.)
(ii) Unnecessary backwashing could be a source of water wastage,
(iii) Leaking pipes around the main transmission and distribution pipeline system and existing the system are a potential avenue for water loses,
(iv) Illegal connections within the distribution pipeline resulting into non-revenue water.

Mitigation Measures

- *Ensure all taps are serviceable and water drawn on need basis,*
- *Backwashing only on design and water quality specifications,*
- *The integrity of the entire treatment should be ensured at all times,*
- *Observe good water use practices at all times.*

6.4.5 Vegetation Cover

(i) Risk of reduced maintenance of vegetation cover, especially grass, shrubs and trees for the dam area
(ii) Tendency to cut trees or damage land cover during maintenance and operations
(iii) Risks of wild animal attraction to the dam and contamination of water from droppings

(iv) Hard rooted trees within vicinity of the dam structure could cause damage to the foundations of the dam structures

Mitigation Measures

- *Encourage operators to sustain vegetation cover through planting trees*
- *Large trees be at least 20m from the plant for safety of the dam structure and water quality*
- *Maintain natural landscaping and terrain of the adjacent locations.*

6.4.6 Health and Safety

(i) Emergency risks including;
- ✓ Dam breaks
- ✓ Water spillage during flood event or above normal rainfall
- ✓ Fire accidents
- ✓ Tank breaks
- ✓ Criminal attacks
- ✓ Land slides
- ✓ Water quality contamination
- ✓ Emergency washout.

(ii) Risks to water quality from contamination (criminal or environmental)

(iii) Workers (operators) health emergency attention.

Mitigation Measures

- *Prepare emergency preparedness plan,*
- *Provide fire extinguishers and fire hydrants for fire safety. Also to be provided should include fire exits from enclosed areas and a fire assembly points,*
- *Provide a fully kitted First Aid box, equipped and accessible to the workers with workers available at all times during operations and maintenance that are trained in First Aid Procedures.*

Chapter 7: Environment and Social Management Plan (ESMP)

7.1 ESMP Principles

The main objective of the proposed Kinale Dam Water Project is to enhance the social and economic wellbeing of the target communities and her immediate neighbourhoods by augmenting access to clean potable water. While appreciating these benefits, it also should be noted that the project also has environmental and social linkages requiring protection interventions in accordance to the established laws and regulations to ensure sustainability and full acceptability of the project by the local communities. To realize this goal, minimal effects to the social and physical environment will require to be integrated into the project through consultations, evaluations and review of the design aspects and subsequent monitoring.

It is recommended that guiding principles specific to this project and the regulations governing water resources management be developed that will allow integration of environmental management considerations in the construction, maintenance of the facility components and public amenities. Among the factors that need to be considered in the project implementation will include;

(i) Adoption of appropriate waste management practices for the waste segregation and storage for safe and sustainable disposal during construction and in the operational and maintenance phases.
(ii) Mechanisms for controlling water wastage through loose taps and transmission and distribution pipelines leakages as well as extravagance in water use.
(iii) Enhancing integration of environmental, social and economic functions into the project implementation
(iv) Consider preventive measures towards possible social and economic disruptions that may arise from the project implementation in accordance with the laid down guidelines.
(v) The contractor and other players in the project activities be prevailed upon to implement the EMP through a sustained supervision and continuous consultations.

7.2 Specific Management Issues

7.2.1 Management Responsibilities

In order to implement the management plan, it is recommended that the Contractor engage a qualified environmentalist to oversee the environmental integration during the construction while a specific Officer is identified for management of environmental aspects during the operations including pollution control, water loss control, waste management, management of sanitation and hygiene measures and safety. In each phase the responsible person will be expected to co-ordinate and monitor environmental management during construction and provide monitoring schedules during operations.

7.2.2 Environmental Management Guidelines

Upon completion and commissioning of the proposed works, it will be necessary to establish appropriate operational guidelines on environmental conservation and social linkages to enable the AWWDA and WSPs management identify critical environmental and social issues and institute appropriate actions towards minimizing associated conflicts. The guidelines should cover among other things; the environmental management programmes, Standard Operation Procedures (SOPs), compliance monitoring schedule and environmental audit schedules as required by law.

7.2.3 Environmental Education and Awareness Raising

There will be need for enhanced awareness and education for the Contractors staff during the construction phase. This will enable appreciation of the EMP content and integration of the same into the associated works. In this regard, therefore, the following steps will need to be considered;

(i) Creation of liaisons on all matters related to environment, utilization of water, health, safety, sanitation and hygiene issues of the water resource development during construction and operation phases,
(ii) Encourage contribution of improvement ideas from the operators and beneficiaries on specific issues related to the management of the works,
(iii) Establish initiatives that would instil a sense of ownership of the facilities and related components to all the target communities.

7.3 Decommissioning Process

Due to the long-term lifespan of the proposed Kinale Dam and the associated treatment plant, pipelines and storage tanks, the decommissioning details may not be envisaged at this stage. A decommissioning audit will be undertaken at least 5 months before the process for any of the components commences, following a notice to decommission. The decommissioning process will be guided by a comprehensive decommissioning plan developed through the decommissioning audit process. However, the following features will need to be decommissioned upon completion of the works;

(i) Contractor's site camp and the associated installations that will need to be removed without compromising on the safety and general welfare of the immediate residents. Special care to be given to associated wastes and dust emitted in the process,
(ii) Materials laydown yards that will comprise fresh materials and used items. Each category will be moved safely out of site ensuring minimal or no impacts to the related environment and social setting,
(iii) Wastes and spoil stockpiling sites will be cleared with maximum re-use of the debris either on surfacing the passageways or other grounds such as schools and church compounds.

Table 7.1: Environment and Social Management Plan

Project Phase	Environment and Social Issue	Anticipated Impacts	Corrective Measure	Responsibility	Timeframe & Cost Estimate	Monitoring Indicators
Construction	Environmental resources protection	▪ Loss of vegetation (trees, bushes and shrubs.) ▪ Introduction of alien plant species during replanting and grassing	▪ Compensate KFS for the loss of the forest materials at the dam area and its associated infrastructure	▪ AWWDA ▪ KFS	During construction period KShs. 50 million	▪ Payment to KFS
			▪ Provide sufficient budget for the restoration of the project sites that will be affected by the project	▪ AWWDA	During construction period	▪ Availability of funds
			▪ Support rehabilitation of the 100ha of the degraded forest areas in Kijabe forest block,	▪ AWWDA/KFS	During construction	No. of Ha Rehabilitated
			▪ Support renovation of staff houses at the Kinale Forest Station and Kereita forest stations,	▪ AWWDA/Contractor	During construction	No. of houses renovated and improved condition of house
			▪ AWWDA, KFS and the County Government of Kiambu to identify areas for re-afforestation to offset the biodiversity loss at dam site.	▪ AWWDA ▪ KFS ▪ County Government of Kiambu	During construction	No. of sites rehabilitated
		Soil loss	▪ Restrict earth works to work locations/areas ▪ No soil should be disposed off site (use soil within the trenches and excavations for backfilling)	▪ Contractor	During construction No direct cost	Level of soil removal
		Surface drainage disruption	▪ The landscaping to be guided by surface topography ▪ All surface will be protected from the potential effects of soil erosion	Contractor Supervision AWWDA Project Engineer and WSP Technical Manager	▪ During construction ▪ No extra cost	Established drainage network

Project Phase	Environment and Social Issue	Anticipated Impacts	Corrective Measure	Responsibility	Timeframe & Cost Estimate	Monitoring Indicators
			▪ Isolated surface drains from point pollution sources.			
		Air pollution	▪ Earthworks to be done under dump conditions in order to reduce dust ▪ Maintain construction equipment at serviceable conditions	Contractor	During construction	Dust levels during the works
		Waste management	▪ Have a designated area for waste disposal ▪ Adopt waste segregation for better waste handling including separate handling of hazardous wastes ▪ Organize waste collection by authorized waste handlers	▪ Contractor	During construction	Level of conflicts at disposal locations
			▪ Spoil dumping at designated areas ▪ Proper agreements to be drafted between contractor and concerned parties	▪ Contractor ▪ Concerned parties	During construction	
	Health and safety	▪ Injuries from machinery ▪ Falls ▪ Fire accidents	▪ Provision of PPEs ▪ Provide warning tapes on construction site ▪ Provide fire extinguishers and fire hydrants for fire safety. ▪ Also to be included are fire exits from enclosed areas and a fire assembly points.	Contractor	During construction	▪ Safety precautions ▪ PPE provisions ▪ Sanitation facilities
	Sanitation and hygiene	Possible spread of diseases (water borne diseases e.g. typhoid, cholera)	▪ Provision of proper sanitation facilities (portable toilets) ▪ Ensure regular exhausting of the toilets	Contractor	During construction	

Project Phase	Environment and Social Issue	Anticipated Impacts	Corrective Measure	Responsibility	Timeframe & Cost Estimate	Monitoring Indicators
		Potential for spread of Corona Virus 2019 within the workplace and site camp	▪ Ensure compliance to Ministry of Health directives on prevention of spread of Corona Virus 2019			
	Noise and vibrations	Possible noise and vibrations from the earth works	▪ Limit the works to day time in order to avoid noise and vibration nuisance ▪ Ensure plant and equipment are well maintained	Contractor	During construction	
Operations	Environmental Resources Protection	Water loss	▪ Reduce the impact of non-revenue water by avoiding illegal connections through environmental education ▪ Backwash only on specification and/or necessary ▪ Prompt repair and maintenance of pipeline leakages	WSPs	No direct cost (integrated in the operations cost	
		Loss of land cover due to soil erosion and landslides	▪ Sustain vegetation cover including grass, shrubs and trees within the weir locations ▪ Maintain a tree nursery to encourage neighbouring communities on tree planting	WSPs	KShs. 200,000 per year	Extent of land cover
		Waste Management	▪ Provide waste bins in all operation areas for segregated waste collection ▪ Engage qualified and legible waste handling service provider for external disposal of waste if any	WSPs	~KShs. 100,000 annually	State of waste collection and general management

Project Phase	Environment and Social Issue	Anticipated Impacts	Corrective Measure	Responsibility	Timeframe & Cost Estimate	Monitoring Indicators
			▪ Organic materials recovered during routine system maintenance and dry plant matter to be composted			
		Silt management	▪ Optimizing the intake inflow mechanism to avoid intake of silt which could block the intake pipelines ▪ Scheduled scouring of the dam.	WSPs	Kshs. 200,000 annually	Inspection reports
	Social Aspects	Health and Safety Problems	▪ Provide workers with their statutory medical cover facilities ▪ Safety measures to be undertaken during the works to include development of Safe Operating Procedures and Manuals and Emergency Response Plan ▪ Ensure adequate safety signage and information around potentially dangerous areas	WSPs	~KShs. 400,000 annually	Safety audits findings
		Sanitation and hygiene challenges	▪ Ensure adequate provision and maintenance of sanitation facilities ▪ Ensure waste water management mechanisms for safety of workers and water quality	WSPs	No direct costs (part of the operations)	Soundness of the sanitation facilities
		Surrounding Communities	▪ Ensure continuous communication and information sharing on the day to day operation of the dam and its associated facilities.	WSPs	Costs to be met by the users on demand	Social satisfaction
		Land acquisition	▪ Implementation of Resettlement Action Plan (RAP)	AWWDA	Ksh 17.5 million	RAP completion report
	Hydrology	Impacts on downstream users	▪ Ensure the compensation flows set for the dam are adhered to, ▪ Define and implement a monitoring plan for the Gatamaiyu River with	WSPs/WRA	No direct costs (part of the operations)	Abstraction data and management plans

Project Phase	Environment and Social Issue	Anticipated Impacts	Corrective Measure	Responsibility	Timeframe & Cost Estimate	Monitoring Indicators
			respect to inflow rates, silt levels and water quality trends over a duration of time. ▪ All natural drains in the catchment areas be delineated for management and protection to reduce entry of silt and pollutants into the dams. Protection may include soil erosion control measures, vegetation enhancement and introduction of silt traps at farm levels.	WSPs WSPs /AWWDA/WRA		
	Dam Safety		▪ Adequate diversion of the river and protection of the site during construction, ▪ Prepare relevant plans (Plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan, ▪ Prepare an emergency preparedness plan, ▪ Design and install metrological sensors and alarm during the construction to alert workers in case of risk of flood, ▪ Ensure use of high quality standard materials during construction phase.	AWWDA/Contractor / WSPs	No direct cost (part of construction, supervision and operation costs)	Availability of relevant plans
Total Direct Cost = KSHs. 68.4 Million						

Chapter 8: Conclusions and Recommendations

8.1 Conclusions

I. The proposed project is part of the Master Plan for Developing New Water Sources for Nairobi and Satellite Towns that addresses the water requirements and sources for Nairobi and its satellite towns including Limuru and Lari. The project will therefore contribute towards realization of the Plan.

II. Implementation of the project will not have significant impacts on the environment and social setting of the areas. The dam, treatment plant and raw water mains are located within the Kinale Forest where all the necessary authorizations for the works shall be sort from Kenya Forest Service (KFS) prior to works commencement. A letter to KFS requesting for the authorization has been done (see appendix 4) and the authorization process is ongoing. Distribution pipelines are located within the road reserves, ground masonry tanks located within public land where there are existing institutions. Only a small section of the reservoir will be located within settled area.

III. The dam construction has potential linkages to the environmental and social settings, in each case posing short- and long-term co-existence. Social benefits are to be enhanced while mitigation of negative impacts constitutes a larger part of this ESIA Report. This calls for collaborative management plans focused on the various social and environment sub-sectors.

IV. The dam by nature is an environmental feature as a large water body. Its influence on the are micro-climate cannot be ignored while transformation of the local ecological conditions is also a reality.

8.2 Recommendations

Among specific recommendations

(i) The implementation of the project should blend with the surrounding land use trends.

(ii) Social and environmental impacts will be addressed by ensuring appropriate tools have been developed and adopted. These tools, to be prepared under the Construction Environment and Social Management (C-ESMP) will include the following,

- Health and Safety Plan
- Noise and Air Quality Management Plan
- Stakeholders and Social Engagement Plan
- Labour Management Plan
- Prevention of Gender Based Violence Plan
- Waste Management Plan (including spoil disposal)
- Traffic Management Plan
- Emergency Preparedness Response Plan

(iii) Due consideration should be given to the prevention of spread of Corona Virus 2019 during the project construction phase by ensuring that the contractor remains compliant with the directives issued by the Ministry of Health.

(iv) The dam development and operations should consider integration of comprehensive Catchment Management Plan with involvement of relevant stakeholders and communities in the key watersheds.

(v) It is recommended that a weather station be provided at the dam to facilitate monitoring of ecological transformation trends and emergent climatic conditions.

(vi) Flood control downstream will need to be monitoring to quantify impacts over a duration of time.

Appendices

Minutes of Meeting with KFS

PROJECT:	**PROPOSED CONSTRUCTION OF KINALE DAM & WATER TREATMENT PLANT**
DATE AND TIME:	21 September 2020 1130 Hrs
MEETING PLACE:	KENYA FOREST SERVICE OFFICE, KINALE
PRESENT:	As per the attached attendance list

AGENDA

1. Introduction
2. Brief Description of the Project
3. Sites Proposed
4. Surveys Works
5. Way Forward

1. Introduction

The Chair welcomed all the members to their Kinale Forest Office and requested attendees to introduce themselves and thereafter invited the Agency's Chairperson to give his opening remarks.

2. Brief Description of the Project

The Chair invited AWWDA staff i.e. Albert Ocharo to give a brief description of the project to the attendees so as to give an understanding. The meeting was informed that the proposed water supply project involve construction of a new dam to supply water to the project areas of Lari, Limuru and Kikuyu. Kinale earth embankment dam in with a maximum height of 34m and 20m respectively. The Objective of the project is to supply potable and adequate water to Lari, Limuru and Kikuyu Sub-Counties through an integrated sustainable water scheme.

3. Sites Proposal and Scope

It was further explained that the proposed site would involve the construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Morning glory), RC diversion culvert, intake tower, draw-off, tower Access Bridge, access road and Conventional full treatment plant with a capacity of 30,000 m3/day. This include the offices, operators' houses, and a 12,000m^3 storage tank.

It will also consist of a raw water mains 500mm internal diameter (Steel pipe), 8 km long through the forest area to the proposed treatment plant at the edge of the forest. Distribution mains will also be laid from the treatment plant along Nakuru-Nairobi highway (A104) upto Limuru.

4. Surveys to be Carried Out

For smooth flow and accurate data collection it was agreed that thorough survey works should be carried out so as to determine the project sustainability and viability. The main survey works would include; Ground survey & Hydrological survey.

It was agreed that KFS will undertake the assessment for both Option 1 and 2 to enable them make an informed decision. The tree assessment would cover the dam area approx.. 48Ha, raw water pipeline approx.. 1.8 Ha and Treatment Plant Approx.. 2Ha.

It was reported that AWWDA was in the process of undertaking an Environmental and Social Impact Assessment Study to be submitted to NEMA for review and approval.

5. Way Forward

i. It was agreed that a joint field survey to be carried out by both the AWWDA team and the KFS official so as to have the reservoir limits pegged to facilitate the forest inventory process.
ii. AWWDA team was to finalize on the total acreage that will be required after the survey process.
iii. KFS noted that AWWDA should consider rehabilitating sections of the forest that are degraded at 2X the total area that will be taken by the proposed Kinale Dam Water Project.
iv. It was advised that there should be sufficient allocation of funds for the conservation activities.

The meeting ended at 1230hrs

Signed by:

..…….. Date …….

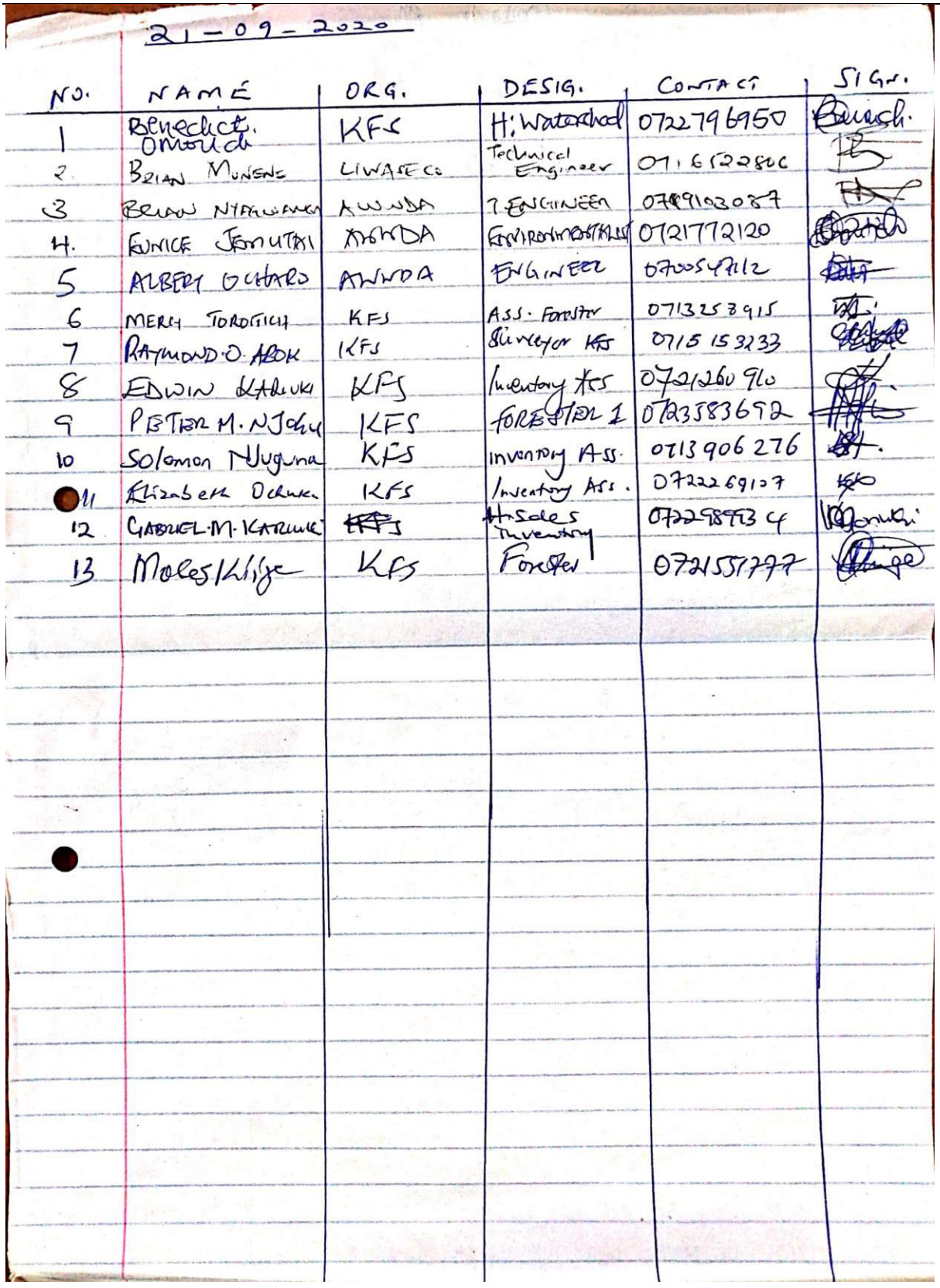
Eunice Cherutich

ATHI WATER WORKS DEVELOPMENT AGENCY

..…….. Date …….

Benedict Omondi

KENYA FOREST SERVICE



21-09-2020

NO.	NAME	ORG.	DESIG.	CONTACT	SIGN.
1	Benedict Omondi	KFS	Hi; Watershed	0722796950	
2	Brian Munene	LIWASECO	Technical Engineer	071652280	
3	Brian Nyakwanga	AWWDA	? Engineer	0799102087	
4.	Eunice Jemutai	AWWDA	Environmentalist	0721772120	
5	Albert Ochard	AWWDA	Engineer	0700547112	
6	Merly Torotich	KFS	Ass. Forester	0713253915	
7	Raymond O. Abok	KFS	Surveyor KFS	0715 153233	
8	Edwin Kabuki	KFS	Inventory KFS	0720260910	
9	Peter M. Njoki	KFS	Forester 1	0723583692	
10	Solomon Njuguna	KFS	Inventory Ass.	0713 906 276	
11	Elizabeth Ochuka	KFS	Inventory Ass.	0722269107	
12	Gabriel M. Katuli	KFS	Hr Sales Inventory	0722898934	
13	Moses Kiige	KFS	Forester	0721557777	

Attendance Sheet for Meeting with National Government Administration Officers

KINALE DAM WATER PROJECT

STAKEHOLDER CONSULTATION FORM

NO.	NAME	DESIGNATION	CONTACT	DATE	SIGNATURE
1	Daniel M. Dkondo	Acct	0717576108	10/11/2020	
2	Alfred K. Langat	Ag CC Kinale	0728588706	10/11/2020	
3	John M. Mokoge	Acting Chief Kinale	0724981385	10/11/2020	
4	Joseph M. Mbugua	Snr Asst Chief Kinale	0725410897	10/11/2020	
5	Vincent W. Kibunja	S.O - Athi	0704711293	10/11/2020	
6	Eunice S. Cheruiyot	SSO - Athi	0721772122	10/11/2020	
7	Geoffrey N. Nyaga	Ag Chief	0720230459	10/11/2020	
8	Lincoln S. Kagunyi	ACC L (Ag)	0721433553	10/11/2020	

Minutes of Public Consultation Meetings

RESSETLEMENT ACTION PLAN IMPACT ASSESMENT FOR THE PROPOSED KINALE DAM WATER SUPPLY IN KIAMBU COUNTY

MINUTES OF PUBLIC CONSULTATION FORUM NO. 1 WITH STAKEHOLDERS HELD ON 19TH NOVEMBER 2020.

ATTENDANCE LIST

Attached

AGENDA

1. Introductions
2. Brief on AWWDA and its mandate
3. Brief on project scope/nature of works/duration/beneficiaries
4. Grievance Redress Mechanism – Grievance desk/Procedure
5. Deliberations(Q&A)
6. Closing Remarks

1/1/2020: PRELIMINARIES.

- The meeting was called to order at 10.00am by the Area local administration after which prayers were led by one of the community members.
- The meeting was informed by the area local administration that, Athi Water Works Development Agency (AWWDA) had informed them of the proposed Kinale Dam project and further requested through the administration's office to facilitate in holding a public consultative forum with the area residents within Kinale location.

2/1/2020: BRIEF ON AWWDA & ITS MANDATE

- The meeting was informed that AWWDA is a state corporation under the Ministry of Water, Sanitation and Irrigation whose mandate is development of bulk water and sewerage infrastructure within its area of jurisdiction (which is Nairobi, Kiambu and Murang'a counties).

3/1/2020: PROJECT SCOPE/NATURE OF WORKS/DURATION/BENEFICIARIES.

- AWWDA informed the members present of the proposed Kinale Dam Water Supply project which entailed construction of an earth filled dam within Kinale & Kereita forest, raw and treated water transmission pipelines to be laid within the forest area and the road reserves respectively and a water treatment plant located within the forest as well.
- The proposed project purpose is to serve the residents of Limuru town, Kimende, Kwambira and Ndeiya towns where off takes shall be made to feed the existing pipelines in towns. In addition, the residents around the proposed dam site would also be served by the proposed project.
- The meeting was informed that prior to commencement of any project, public participation forums are mandatory to inform the public of the proposed works and have consultative sessions with the potential affected persons and the public to get their opinions and views.
- This would also form a basis of informing the public of the expected impacts to the area residents and the proposed mitigation measures.
- It was communicated that prior to commencement of the project, an Environmental and Social Impact Assessment report will be prepared for further submission to NEMA for licensing of the project.
- Further a Resettlement Action Plan would be developed for the project detailing the social impacts of the project, project affected persons, affected assets inventory (where applicable) and a socio economic baseline survey for the affected communities. The findings of the baseline survey would form part of the ESIA report and RAP.
- Valuation of the affected assets would be carried out on a date communicated in advance through the local administration office.

4/1/2020: GRIEVANCE REDRESS MECHANISM

- The PAPs were informed pending formation of a grievance committee for the proposed project. The local administration office would stand in as the grievance desk for the project and all issues/complaints/concerns to be raised at the office for further action by the project team in cases where their intervention/response is required.

5/1/2020: DELIBERATIONS

1. **Will compensation for trees within the conservation area be carried out**
   An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.
2. **Will they be allowed to retain trees that were valued and compensated**
   The PAPs were informed that they could retain the compensated assets.
3. **The proposed dam would cut access to parcels of land which extent to both sides of the ridge**
   In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.
4. **What is the extent of the dam**
   The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.
5. **The dam poses as a security risk to the residents of the area especially children, what measures will be taken**
   Upon completion of the construction works for the dam, the implementing agency will permanently fence off the dam area. There will be restricted access to the dam.
6. **Will there be employment opportunities for the community**
   Once the construction works commence, the community will be prioritized with regards to employment opportunities available
7. **What is the required distance for the buffer zone**
   The proposed project will consider a buffer zone of 30m
8. **In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider**
   If the land is greatly affected, full acquisition will be carried out for the parcels.
9. **Who will carry out the land acquisition for the project**
   AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project
10. **What measures are in place to address the micro-climate change that will be caused by the dam**
    The PAPs were informed the proposed dam will not have a significant change in the micro-climate conditions in the area.
11. **Will the residents/landowners around the dam be served by the dam?**
    The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing boreholes would be done to boost the quantity of water further.

6/1/2020: WAY FORWARD

- The public was informed that a follow up meeting with the potential identified PAPs would be carried out and the date communicated through the area local administration office. The specific affected persons were urged to be in attendance.

- There being no other business the meeting ended at 12.00pm

SIGNED

NAME:……

…… Date……...

Signature: Area Chief

NAME:……

…… Date ……...

Signature: Athi Water Works Development Agency

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/NOVEMBER/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
1.	VIENNA W. KIBUKOSA.	AWWDA.	29218580.	0715088292.	
2.	BRIAN MUNENE	LIWASECO	30204297	0116522806	
3	BISHOP GOTHAMBUGUA	KINALE	3068036	0722913847	
4	JOHN M. NJOROGE	KINALE	8519507	0724961385	
5.	JOSEPH M. MBUGUA.	KINALE	4317090	0725410897.	
6.	IVY WACHUI GATHII	AWWDA	32450653	0715777622	
7	STEPHEN MUGO MUTURI	KINALE	34289713	0792847745	
8	GEOFFREY KIMANI KINYANJUI	"	18864461	0722 270 944	
9	PETER KARIUKI	"	31690679	0792582778	
10	PATRICK Kimani Kinyanjui	KINALE	35 633 714.	07 46. 327 684.	
11	SAMUEL MBATIA GIKUNI	KINALE	344 7760	0718 082 148	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ---------/---------/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
12	DOMINIC K. KARUGA	KINALE	13533508	0723410647	
13	PETER NDUNG'U IHIGA	"	22020485	0707566941	
14	JOHN KAMAU	"	9722538	0721815481	
15	DOMINIC KIMANI	"	23135508	0725947041	
16	SAMUEL NDUNG'U	"	12530190	0723289341	
17	JONATHAN KABANJA	"	2761 5240	0724636570	
18	MICHAEL K. WAMBUGU	"	27517318	0725377477	
19	PETER MATHENGE	"	36438398	0797088025	
20	PETER WAIGONGO	"	6850070	0727210469	
21	FRANCIS KIRUGO	"	38038126	0759008423	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/11/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
22	PATRICK. K. GIKONYO	KINALE	21438460	0724145629	
23	STEPHEN KIARIE THADI	"	24613340	0742439468	
24	TOM GICHO WAIRIMU	"	29217801	0702688226	
25	SIMON KARANJA	"	22261506	0701065124	
26	JOSHUA NJOROGE	"	2570997	0723816216	
27	DAVID KARANJA WANGOMBE	"	21845023	0721316124	
28	STEPHEN MAINA KARANJA	"	12941930	0728622129	
29	JOHN MUNYAMBU	"	26602425	0728473926	
30	JOHN KAMARE	"		0713955042	
31.	Simon Mureithi Kanan	"	28456223	0704593470	
32.	PETER GICHANGA MUNYOIKE	"	34062265	0704087192	
33.	JOSEPH NDUNG'U MACHARIA	"	23338192	0790990	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/11/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
34	FRANCIS MUHIA	KINALE	4664263	0713983842	
35	ABRAHAM KARANJA	"	34711380	0714436151	
36	MOSES NGUGI	"	13029028	0724690207	
37	SAMUEL KARIUKI	"	22739160	0723254809	
38	LOISE NYAMBURA	"	6233094	0724447064	Loice
39	ZACHARIAH CHEGE	"	26703433	0746999540	Mwangi
40	Arthur Mwangi	"	35863123	0797481730	
41	HAMAN MUIRURI	"	37227427	0726619977	
42	Amos NGIGE	"	22104793	0728954511	
43.	JOSPHAT MUTUA	"	31767874	0714241933	
44.	DAVID MWANGI	"	21549435	0721604866	
45.	JOHN GITUBIA	"	29093799	0757630449	
46.	FRANCIS KIMANI	"	35741648	0703668487	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----17----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
47.	Hezekiah Wakisaberya	Kinale	34928548	0721 954 856	~~Hezekiah~~
48.	PETER KAMAU M.	"	24933460	0724 306 496	
49.	JANDAYO MUNG'ARA	"	28015028	0727 110 719	~~Zhad~~
50.	DENNIS KIAKIERU	"	33447315	0715 396509	
51.	JOHN NJENGA	"	20516383	0710420540	~~JOHN~~
52.	PETER KIAKIERU KIRE	"	27605320	0700862074	
53	CHARLES NYORO KIMANI	"	8748541	0720339505	
54	PETER KINYANJUI MAINA	"	~~4756~~ 4665627	0721647084	
55.	MARY ~~NYAMBURA~~ NYAGURA	"	13727288	0713298467	
56.	ISAAC MATHU	"	11803117	0716392638	
57.	DAVID MUNIU		30719444		
58.	SAMUEL MWANGI		3553198	0741177492	
59.	PETER KINYANJUI		5253206	0715773876	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
60.	MARY KAMAU	KINALE	30714261	0745545782	
61.	RACHEAL KIANJIRU	"	23483512	0795294158	
62	PETER KIMANI	"	22017787	0727873585	
63	JOHN MUTHAMA	"	4209613	0721329287	
64	PAUL NJOROGE GATHITU	"	3114218	0714502646	
65	LAWRENCE CHEGE	"		0798232537	
66	ISAAC CHEGE	"		0727938218	
67	SAKIERIA WAMBUI	"	14514374	0723200225	Swambui
68	MELISA KIANJIRU	"	11531351	0792464902	
69	SIMON GICHUHI		24671089	0703354941	S G M
70	JAMES MWANGI K.		~~2040~~ 1340229	0723854535	
71	SIMON NGOTHO		36076257	0755997208	
72.	PETER NJENGA M.		10424827	0710131334	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
73.	SARAH WANJIRU	KINALE	26691655	0759464082	
74	JAMES KAMAU	"	36729032	0726504067	
75	EDITH WANJIKU	"	28194489	0720281828	
76	SAMUEL GITAHI	"	5252827	0711466943	
77	WALLACE GITAU	"		0716687225	
79	PETER KIBE	"		0743715099	
79	DANSON KARUGA	"	38588155	0713527886	
80	SAMUEL MWANGI	"	37041985	0711607461	
91	JOSEPH MACHARIA	"	30774322	0726987551	
82.	AGNES KIBE		26254187	0707572468	
83.	PETER HUGHI		27272245	0757543307	
84.	ESTHER WANJIRU		30944115	0703215702	
85.	JOHN THUKU		37513956	0719212841	
86.	PHILIP KARANJA		36085070	0790019042	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
87.	PATRICK NJOROGE	KINALE	24644304	0711604996	
88.	JOHN MAINA	"	~~36~~ 26331459	0719 844534	
89	JORAM KANG'ETHE	"	24071070 ~~24077~~	0722106288	
90.	DAVID NDUNG'U	"	23258154	0724469398	
91	PAUL CHEGE	"	13412564	0769223652	
92	PETER KAMAU	"	23480782	0724399056	
93	JOHN NG'ANG'A	"	11389857	0720577837	
94	SILAS KANYANGO	"	12522654	0721646607	
95	PETER KARIUKI	"	29468155	0798556618	
96.	NOAH GATITU		29031515	0714470928	
97.	SAMUEL KAMAU		23380944	0700790590	
98.	STANELY MUGA		34714231	0703901332	
99.	JOHN NJUGUNA		38422347	0745267300	
100.	CECILIA WAIRIMU		34119238	0768763309	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---NO.1--- PAPS ATTENDANCE REGISTER DATE: ---19---/---11---/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
101	DAVID GITHINJI	KINALE	29804671	0707549566	
102	JOSEPH NJOROGE	"			
103	DAVID GICHUKA	"	22591491	0727492237	
104	DICKSON NJENGA	"	6252019	0723171524	
105	PAUL KARIUKI	"	29817171	0726081250	
106	PAUL MBURU	"	23673581	0724346246	
107	ARTHUR MWANGI	"	30605905	0716607759	
108	JACOB KAMAU	"	22649569	0725119758	
109	SIMON KAKIERU	"	24070450	0705961296	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
110	PETER MACHARIA NDICHU	KINALE	26295174	0794778143 ~~0797794778143~~	
111	PETER GATUNA	"	10344340	0725689541	
112	FREDRICK MBUGUA	"	24543647	0	
113	FRANCIS MUNGAI	"	228[illegible]19219	0724119195	
114	SIMON MUCHIRI	"	11616856	0700597926	
115	ROBERT NJOROGE	"	5782098	0725345424	
116	STEPHEN NYORO	"	~~07~~ 7279942	0722794265	
117	SAMUEL KANJA	"	3640681	0726557135	
118	DAVID NJOROGE	"	13842030	0706911062	
119	Alfred K. Langat	ACC Kinale Division	22940502	0728588706	

RESSETLEMENT ACTION PLAN IMPACT ASSESMENT FOR THE PROPOSED KINALE DAM WATER SUPPLY IN KIAMBU COUNTY

MINUTES OF PUBLIC CONSULTATION FORUM NO. 2 WITH PROJECT AFFECTED PERSONS HELD ON 26TH NOVEMBER, 2020.

ATTENDANCE LIST

Attached

AGENDA

7. Introductions
8. Brief on AWWDA and its mandate
9. Brief on project scope/nature of works/duration/beneficiaries
10. Grievance Redress Mechanism – Grievance desk/Procedure
11. Deliberations(Q&A)
12. Closing Remarks

1/2/2020: PRELIMINARIES.

- The meeting was called to order at 12.00pm by the Area local administration after which prayers were led by one of the community members.
- The meeting was informed by the area local administration that further to the public consultation forum held on 19th November, 2020, Athi Water Works Development Agency (AWWDA requested through the administration's office to facilitate in holding a consultative forum with the affected persons.

2/2/2020: BRIEF ON AWWDA & ITS MANDATE

- The meeting was informed that AWWDA is a state corporation under the Ministry of Water, Sanitation and Irrigation whose mandate is development of bulk water and sewerage infrastructure within its area of jurisdiction (which is Nairobi, Kiambu and Murang'a counties).

3/2/2020: PROJECT SCOPE/NATURE OF WORKS/DURATION/BENEFICIARIES.

- AWWDA informed the PAPs of the proposed Kinale Dam Water Supply project which entailed construction of an earth filled dam within Kinale & Kereita forest, raw and treated water transmission pipelines to be laid within the forest area and the road reserves respectively and a water treatment plant located within the forest as well.
- The proposed project purpose is to serve the residents of Limuru town, Kimende, Kwambira and Ndeiya towns where off takes shall be made to feed the existing pipelines in towns. In addition, the residents around the proposed dam site would also be served by the proposed project.
- Part of the surveyed area for the dam reservoir was situated outside the forest area within the settlements hence there was need to inform the persons within the identified area of the proposed works.
- It was communicated that an Environmental and Social Impact Assessment report will be prepared for further submission to NEMA for licensing of the project and a Resettlement Action Plan would be developed for the project detailing the social impacts of the project, Identified project affected persons, affected assets inventory & valuation report (where applicable) and a socio economic baseline survey for the affected communities. The findings of the baseline survey would form part of the ESIA report and RAP.
- Valuation of the affected assets would be carried out on a date communicated in advance through the local administration office.

4/2/2020: GRIEVANCE REDRESS MECHANISM

- The PAPs were informed pending formation of a grievance committee for the proposed project. The local administration office would stand in as the grievance desk for the project and all issues/complaints/concerns to be raised at the office for further action by the project team in cases where their intervention/response is required.

5/2/2020: DELIBERATIONS

12. Who will carry out the land acquisition for the project

AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project

13. **What rates will be adopted for compensation of any assets**
    The meeting was informed that the valuer would adopt the current market rates for items valued which will be further subjected to review by NLC who are the mandated body to carry out compulsory acquisition.
14. **Will compensation for trees within the conservation area be carried out**
    An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.
15. **Will they be allowed to retain trees that were valued and compensated**
    The PAPs were informed that they could retain the compensated assets.
16. **The proposed dam would cut access to parcels of land which extent to both sides of the ridge**
    In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.
17. **What is the extent of the dam**
    The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.
18. **In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider**
    If the land is greatly affected, full acquisition will be carried out for the parcels.
19. **Will the residents/landowners around the dam be served by the dam?**
    The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing boreholes would be done to boost the quantity of water further.

6/2/2020: WAY FORWARD

- The PAPs were informed the valuation exercise would be carried out and timely notices through the local administration office and the village elders would be issued. The affected persons were requested to be present for the inventorying activity which would be spearheaded by the valuer.
- There being no other business the meeting ended at 2.00pm

SIGNED

NAME:……

…… Date……...

Signature: Area Chief

NAME:……

…… Date ……...

Signature: Athi Water Works Development Agency

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---NO.2--- ATTENDANCE SHEET DATE: ---26---/---11---/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
01	Daniel Mwaura Waigongo	1/1383	22340451	0724115608	
02	John Kimiriri Waigongo	1/1383	11770096	0701212 5276	
03	patrick Njoroge		21423994	~~0726~~ 0726928576	
04	Paul Mutunga Ngagi	1/2093	24848660	~~0730~~ 0727305716	
05	Peter Kimani Mwangi	1/1326	9058000	0726170858	
06	John Mwangi Waithaka		11482146	0727872389	
07	George Kairu Kabue	1/2452	0713859	0722 614 257	
08	Josephine Nyambura Kairu	1/2688	0716 697 164	0722 22 35 26	
09	Robert Njoroge Mwaura	~~782~~ 1/792	5782098	0786 373 659	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ---------29---------/---------11---------/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
10	Simon Wacera Karanja		24070450	0705 96 12 96	
11	Joseph Mbaria Mburaru	1/1388	25802513	0718 663 750	
12	Samwel Kimani Njoki	~~1/2357~~ 1/2257	22280023 ~~0708892042~~	0708 892 042	
13	Dominic Kimani Karuga		13533508	0723 410 647	
14	Martin Murithi Kimotho	1/2468	7075949	0722 789 989	
15	Samwel Mbagua Waigongo	1/1383	22340451	0724 115 608	
16	James Muangi Kamau	1/792	1340229	0723 854535	
17	John Njoroge Kimani	1/5131	13535726	0728 822 201	
18	Amos Kibe Githuka	1/1357	26531880	0798 312737	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: 20/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
19	Amos Kibe Waigongo	1/1383	22104793	0728954511	
20	Simon Karanja Githuka	1/1357	22261506	0701065924	
21	Wilson Njugana Waigongo	1/1383	28810306	0727962625	
22	John Nganga Njenga	1/2641	11389857	0720577837	
23	Ibrahim Maina Thiga	1/136878	29247400	0712553747	
24	Paul Kihingo Waigongo	1/1383		0729374450	
25	David Wango Waigongo	1/1383		0723655300	
26	Stanley Chege Karanja		25738272	0745362709	
27	Simon Gitau Mwaura	1/1384	31007283	0759008468	

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KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.2 ATTENDANCE SHEET DATE: 20/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
28	Jusphat Mbugua Mwangi	H2/1/1422	22708101	0759351155	
29	Geoffrey Mbugua Waigongo		11802998	0727849254	
30	Stephen Maina Karanja	1/1905	12941930	0728622129	
31	Peter Kinuthia Kiarie	1/1402	5783027	0721671681	
32	Jusphat Njoroge Kapaki	1/2640	2570997	0723816260	
33	Zadayo Mangara Thiga	1/1368	25752337	0715002484	
34	Samuel Njeru Karanja	1/1907	11802969	0700929535	
35	Peter waigongo Githumiri	1/1383	6850070	0727210469	
36	Elijah Nganga Thandi	1/1845	21526681	0742439488	Nganga

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KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.2 ATTENDANCE SHEET DATE: 29/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
37	Samwel Kariuki Waigongo	1/1385	22739160	0723254809	
38	Paul Njoroge Ndenta		3114219	0714502646	
39	Gladys - Waithira Thandi	1/1845	5783298	0742439468	G waithira
40	Stephen Kiarie Thandi	1/1845	24613340	0742 43 9468	
41	Joseph Njoroge Thandi	1/1845	24713654	0742439468	
42	Wanjiru Ngang'a	1/1380		0718008540	Wanjiru W
43	Fredrick Kinganjai Mangi	1/1844	1189750	0710219909	Fredrick Kinganjai mange
44	Martha Gakuhi Thiga	1/1378	9860579	0700608794	Martha
45	Jane N. Kariuki	1/1329	10849707	0702022725	

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RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ---------- 29 / 11 ----------/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
46	Wariencé Mukaná		8575306	0722855793	
47	Magdeline Wamoro Kararija	1/1908	13535628	0728428053	magdaline
48	Joyce Wambui Kihara	1/1594	3072912	0711309399	JOYCE
49	Eunice Njoki Ndegwa	1/2257	3080934	0723914765	
50	Hannah Mathoni Njeru	~~H3150~~ 1/H3 1/3150	11882195	0716927696	H M
51	Stephen Nyoro Njoroge	1/1382	7279942	0722394265	
52	John Njeru Ndungu	1/3356	7279924	0716293307	
53	Samwel, Mwaura Mwangi	1/2267	9370789	0797543459	
54	Muthanna Njoroge	1/1381	~~0721329287~~ 4309613	0721329287	Muthoma

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MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ----------29----/----11----/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
55	Zadayo Mdngara Njoroge	1/792	29556734	0708 222 510	
56	John Mwangi Mburu	1/2093	12941987	0717784157	
-57	Isaiah Njoroge Mbugua		0481167	0720296419	
58.	VENNA W. LABUNJA.	AWADA.	29278580	0704711293	

Letter to KFS on Access to the Proposed Site

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

Athi Water Works Development Agency
3rd Floor Africa Re Centre, Hospital Rd, Upperhill
P. O Box 45283 - 00100 Nairobi
Tel: (+254) 20 - 2724292/3. Mobile : (+254) 715 - 688272
E-mail: info@awwda.go.ke
www.awwda.go.ke

When replying please quote: AWWDA/MWSI/Vol.XVII (07) PE-ao

28th August, 2020.

Joseph W. Irungu, CBS
The Principal Secretary,
Ministry of Water, Sanitation and Irrigation,
P.O Box 49720-00100,
NAIROBI.

Dear Sir,

PROPOSED KINALE DAM WATER PROJECT
RE: REQUEST TO ACCESS KEREITA FOREST

Reference is made to the above captioned subject.

Athi Water Development Agency (AWWDA) is currently undertaking the feasibility study and designs of the Kinale Dam Water Project whose objective is to supply potable and adequate water to residents of Lari, Limuru and Kikuyu Sub-Counties through an integrated sustainable water scheme.

The project scope involves construction of Kinale Dam, Raw and Treated Water Pipelines, The Water Treatment Plant and other associated infrastructure. The dam is located in Kinale,Kereita Forest at around coordinates (0° 55.190'S 36° 38.859'E) along Gatamaiyu River as per the attached layout drawing.

Preliminary designs estimate that the dam will cover approximately 100 acres within the Kereita Forest as per the attached map. To firm up on the detailed designs, AWWDA wishes to conduct relevant geotechnical investigations around the proposed project location within the forest.

The purpose of this letter is to seek for your assistance in requesting the Ministry of Environment and Forestry to grant access of the dam site in Kereita forest and allow preliminary works to commence; and ultimate construction of the dam.

Yours Faithfully,

ENG. MICHAEL M. THUITA
CHIEF EXECUTIVE OFFICER

Encl.

Hydrological Assessment Report

HYDROLOGICAL ASSESSMENT REPORT:

GATAMAYU RIVER

FOR

KINALE DAM WATER PROJECT

OCTOBER, 2020

Consultant:

James K. Waititu
P.O. Box 55020-00200
NAIROBI
Email: j.waititu@gmail.com

Client

Athi Water Works Development Agency
P. O. Box 45283 - 00100
NAIROBI

Table of Contents

List of Tables

List of Figures

1.0 Name and Details of Applicant

Name:	Athi Water Works Development Agency
Address	P. O. Box: *45283 – 00100*
	NAIROBI
Type of Applicant:	Institution
Water use:	Public water supply

2.0 Location and Description of Proposed Activity

The proposed Kinale Dam Water Project is located in the Kinale/Kereita Forest within the Kikuyu Escarpment Forest. The project proponent had identified a number of locations for the construction of a dam. In its upper reaches, two sites had been identified, namely;

Site 1: A 22m high dam located at coordinates 37 M 0237558, 9898311 (E036.641860, S00.919220) at an elevation of 2560masl;

Site 2: a 44m high dam located at coordinates 37 M 0237829, 9898121 (E036.6443^0, S00.92094^0) at an elevation of 2540masl.

The current study deals with the hydrology relating to Site 1 dam location.

The objective of the project is to supply potable and adequate water to Lari, Limuru and Kikuyu Sub-Counties through an integrated sustainable water scheme.

The project involves the construction of a 22m high dam on Gatamayu River at a location identified by coordinates 37 M 0237558, 9898311 (E036.641860, S00.919220) at an elevation of 2560masl;

(*Map Sheet No134/3, Kijabe, Scale 1:50,000*). The proposed Kinale Dam site 1 and site 2 are depicted on Figure 2-1.

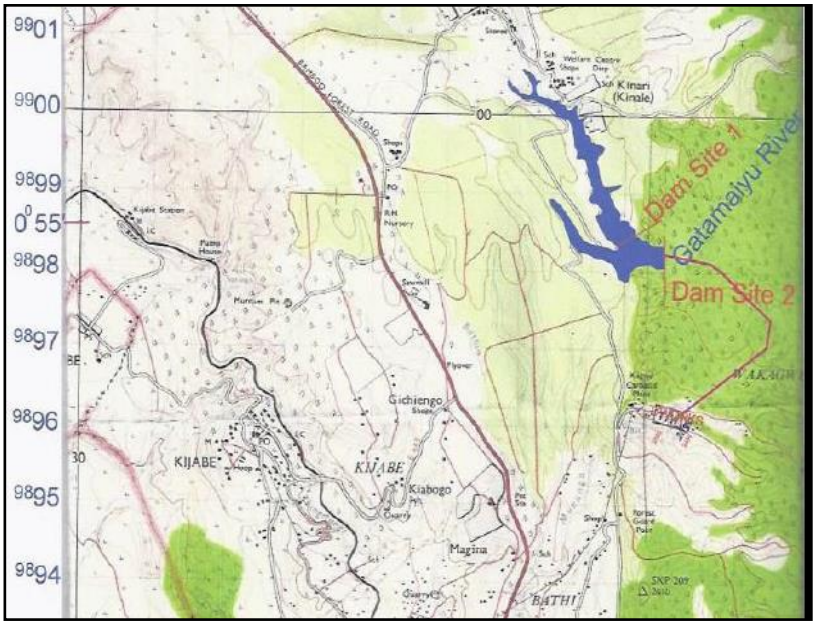

Figure 2-1: Location map of proposed Kinale Dam Site 1 and Site 2

3.0 Climate and Rainfall

3.1 Climate

The upper reaches of the Gatamayu River subcatchment lies within the humid Agro-Ecological Zones of Kenya. The forest zone and the adjoining landform adjacent to the forested area including the proposed Kinale Dam location, fall within the humid zone with fairly cool temperate climate with mean annual temperatures varying between 12^0C and 14^0C.

With the exception of rainfall amounts, other climatological parameters are recorded at very few stations in the river basins within Kenya. However, research has shown that temperature variations can be determined through empirical equations relating temperature to altitude. For Kinale Dam 1 catchment area, however, records from Kimakia Forest Station No. 9036233 have been analysed to show the temperature variations in the Upper Gatamayu River subcatchment. The analysed results are depicted in Table 3.0 and Figure 3-1. The analysis indicates that extreme temperatures in the subcatchment range between a maximum of 21^0 C and a minimum of 6.4^0 C.

Temperatures are highest during the dry months of January to March and lowest between June and August.

Table 3.0: Kimakia Forest Station: Mean monthly temperature variations

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Max	20.3	21	20.5	19.2	17.9	16.5	14.9	15.1	17.7	18.7	18.2	19.3
Mean	13.4	14.1	14.4	14.2	13.3	11.9	11	10.9	12.1	13.3	13.3	13.2
Mean Min	6.4	7.1	8.2	9.2	8.7	7.3	7	6.7	6.4	7.9	8.3	7

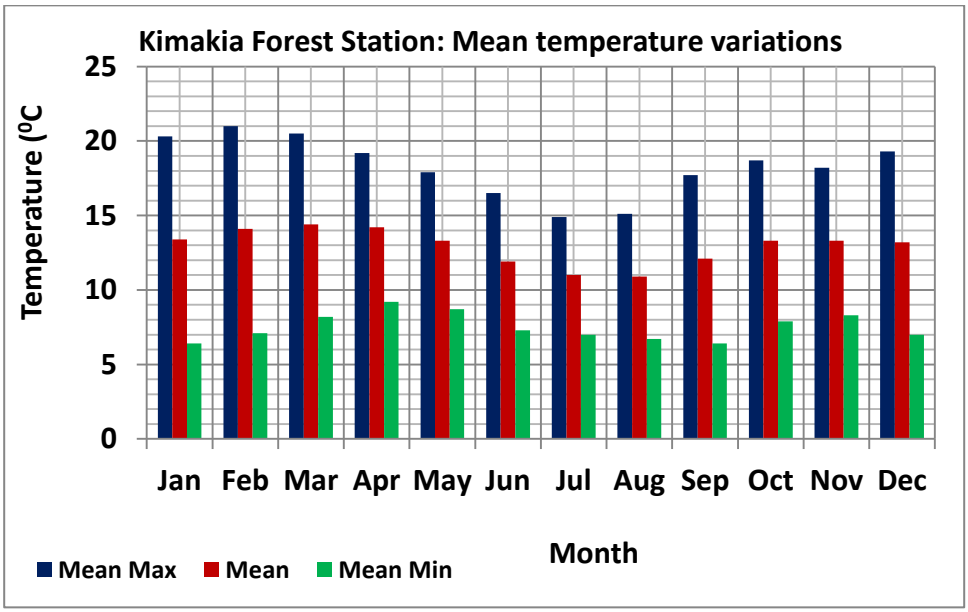

Figure 3-1: Kimakia Forest Station: Mean monthly temperature variations

3.2 Evaporation

Estimates of the rates of evaporation from open water surfaces have direct relevance to problems of economic importance for the country. Such evaporation data make an essential element in studies of crop water requirements; they are basic to catchment area research and management, and have considerable bearing on the feasibility of irrigation projects and water losses from storage structures.

However, there is lack of adequate instrumentation to measure the evaporation rates in Kenya. Accordingly, records observed at distant locations are used to give an estimate of the possible evaporation rates in a region. For the upper Gatamayu River system, Kimakia Forest Station No. 9036233 has been selected to illustrate the evaporation variation in the region. The mean monthly evaporation for Kimakia station is shown in Table 3.1. The monthly evaporation rate results are graphically depicted in Figure 3-2.

Table 3.1: Kimakia Forest Station: Mean monthly evaporation

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Evaporation (mm)	127	124	139	120	101	75	50	56	94	114	103	112

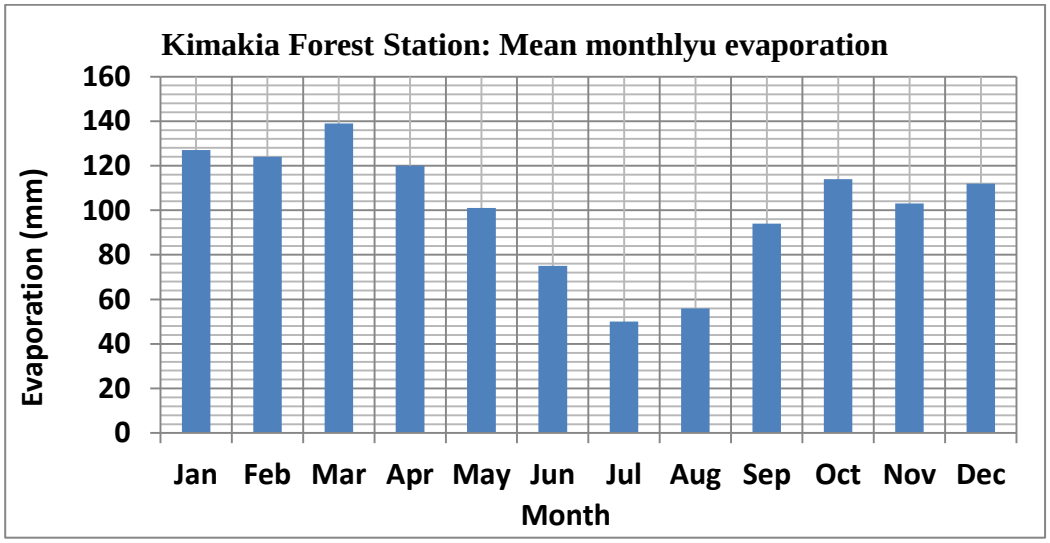

Figure 3-2: Kimakia Forest Station: Mean monthly evaporation

3.2 Rainfall

Rainfall in the Gatamayu River subcatchment and other regions in Kenya are affected by the movement of the Inter-Tropical Convergence Zone (ITCZ). In addition to the large-scale systems, there are regional factors which modify rainfall over most parts of Kenya. In the case of Gatamayu River subcatchment, the Aberdare Mountain Ranges play a major role in modifying the climate.

The rainfall in the subcatchment displays a bimodal pattern with one peak occurring in April during the long rains season and the other peak occurring in November during the short rains season.

The long-term mean monthly rainfall pattern in the upper Gatamayu River subcatchment is depicted in Table 3.2 and Figure 3-3, following analysis of rainfall recorded at Kereita/Kinale Forest Station No. 9036191. Overall, the upper Gatamayu River subcatchment receives a mean annual rainfall of about 1200mm. Monthly rainfall totals for Kereita/Kinale Forest Station are appended as Appendix 1.

Table 3.2: Kereita/Kinale Forest Station: Long-term mean monthly rainfall

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RF	63.6	63.2	104.0	259.6	211.1	65.8	54.7	31.1	35.5	104.7	144.7	71.5

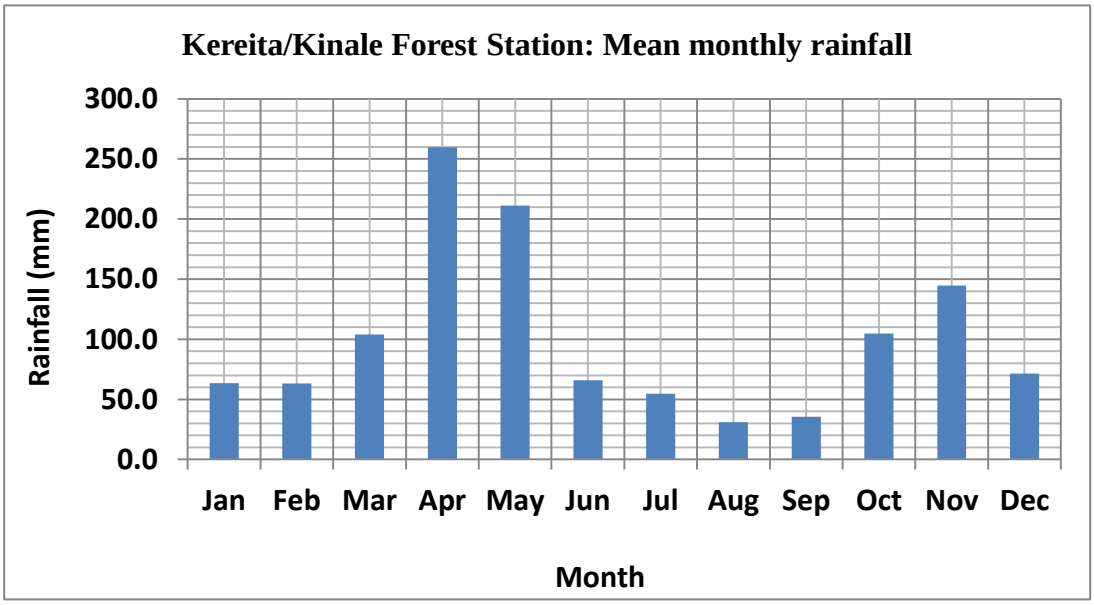

Figure 3-3: Kereita/Kinale Forest Station: Mean monthly rainfall

4.0 Details of River/Water body

The river under reference is Gatamayu River which is a tributary of Ruiru River.

Gatamayu River rises on the south western highlands of the Aberdare Mountain Ranges at over 2600 masl and flows in a south by east direction through the Kikuyu Escarpment Forest, emerging from the forest on the eastern side near Gatamayu Rural Market Centre. The river continues on its south eastern flow direction to discharge into Ruiru River farther downstream.

However, the upper edges of the river in its upper sources within the Kinale/Kereita Forest zone were excised from the forest zone and allocated to the local community for settlement. Fortunately, the forest department is reclaiming most of the original forest land.

Gatamayu River system falls within the Ruiru drainage system identified as subcatchment 3BC. It has a number of tributaries originating within the forest and discharging into the main Gatamayu River within and outside the forest zone. These tributaries contribute most of the baseflow in the river system during the dry periods.

The Ruiru River system was formerly identified as subcatchment 3BC under the previous nomenclature of river basins by the Ministry of Water and Irrigation. Under the new water resources management arrangements, the subcatchment is combined with Thiririka River subcatchment to form the Ruiru River Management Unit in the Athi Water Catchment Management Strategy (Athi-CMS).

The location of the Ruiru Management Unit and the adjacent Nairobi River and Ndarugu River Management Units are depicted in Figure 4-1.

The Ruiru River Management Unit is classified as of high livelihood and commercial importance in the Athi River Catchment Management Strategy (ATHI-CMS).

Livelihood important management units are areas with predominantly rural characteristics i.e. rural and scattered settlements with varying population densities and where small scale subsistence oriented economic activities dominate. This category of classification targets water resources management for equitable allocation and protection to ensure sustainable livelihood of the rural population. This is the situation pertaining to the upper reaches of Ruiru River and its tributaries.

Commercially important units are typically urban and/or industrial areas, including peripheral areas which can be developed as commercial centres. The management focus for these areas is to ensure quality of water resources to develop economic prosperity in the areas. This is the situation around Ruiru Town.

The main issues identified in the Ruiru River Management Unit including the Gatamayu River sub-catchment under the ATHI-CMS include:

- Pollution from agro-chemicals.
- Effluent discharges from rural market and urban centres,
- Water scarcity in relation to demand particularly during very low flows,
- Pollution emanating from runoff from unpaved road surfaces.

To ensure sustainable water resources management and development, the ATHI-CMS recommends a holistic approach in addressing these issues involving all relevant stakeholders

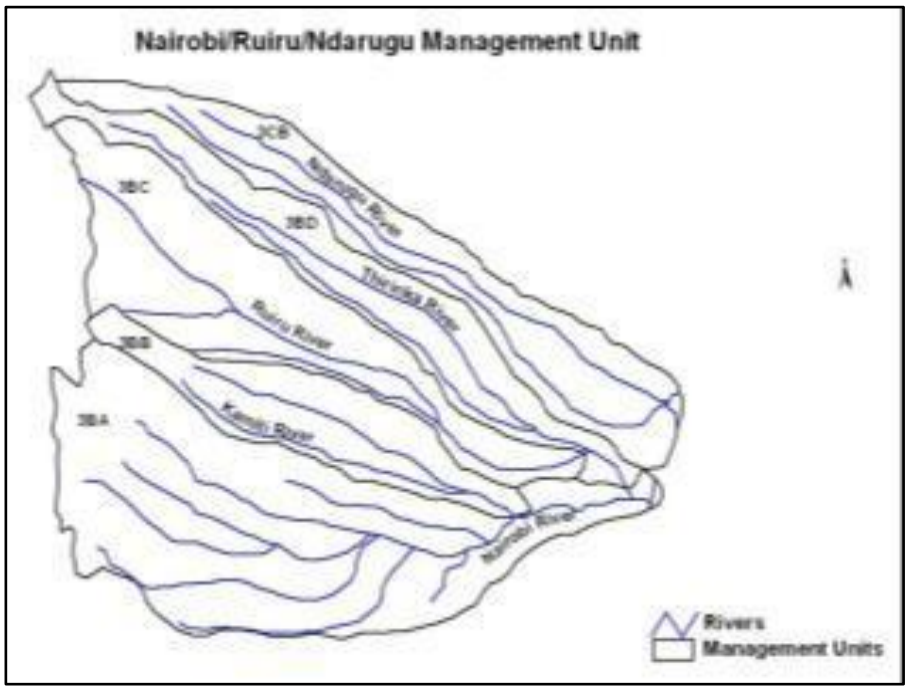

Figure 4-1: Schematic map of Ruiru River Management Unit

5.0 Details of the Catchment

5.1 Drainage of the Area

A drainage basin is an extent or area of land where surface runoff from precipitation and melting snow/ice converge to a single point, usually the exit of the basin, where the waters join another water body, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.

The drainage basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels, and is separated from adjacent basins by a drainage divide.

The drainage of the project area is dominated the Aberdare Mountain Ranges which is the main water tower in the area. The drainage of Gatamayu River subcatchment is symptomatic of a dendritic system, where there are many contributing streams (analogous to the twigs of a tree), which are then joined together into the tributaries of the main river (the branches and the trunk of the tree, respectively). They develop where the river channel follows the slope of the terrain. Dendritic systems form in V-shaped valleys where the rock types are impervious.

The river is characterized by steep valleys in the upper forest zone and middle zones, which give way to gentle rolling plains as the river flows downstream in an easterly direction to discharge into Ruiru River.

The river originates from the Kikuyu Escarpment Forest (Aberdare Ranges) at an altitude of 2600 m.a.s.l. and flows in a south by east direction to emerge from the forest on the eastern side approximately 0.5 kilometre to the south of Gatamayu Rural Market Centre. The river discharges into Ruiru River about 2 kilometres to the south west of Komothai Market Centre.

The topography of the upper reaches of the subcatchment comprises highly dissected ridge landforms with steep slopes of more than 10%.

In the characterization of stream patterns, Gatamayu River has a dendritic pattern, with small springs expanding to small streams, then to rivers that join the main trunk of Gatamayu River. From the stream pattern characterization, stream order classification is developed that reflect the degree of branching or bifurcation of the stream channels within the basin. In a channel network map of a basin, the smallest fingertip tributaries are given order 1. When two channels of order 1join, a channel segment of order 2 is formed. When two channels of order 2 join, a channel segment of order 3 is formed, etc. A schematic map of this ordering is shown on Figure 5-1. The trunk of the stream through which all the discharge of water and sediment passes is therefore the stream segment of the highest order. Considering Gatamayu River at the proposed Kinale Dam Site 1, it is clear that Gatamayu River at this location comprise a channel segment of a very weak order 2. This is a narrow and elongated segment of the river system. Schematic map showing the stream pattern of upper Gatamayu River is shown in Figure 5-2.

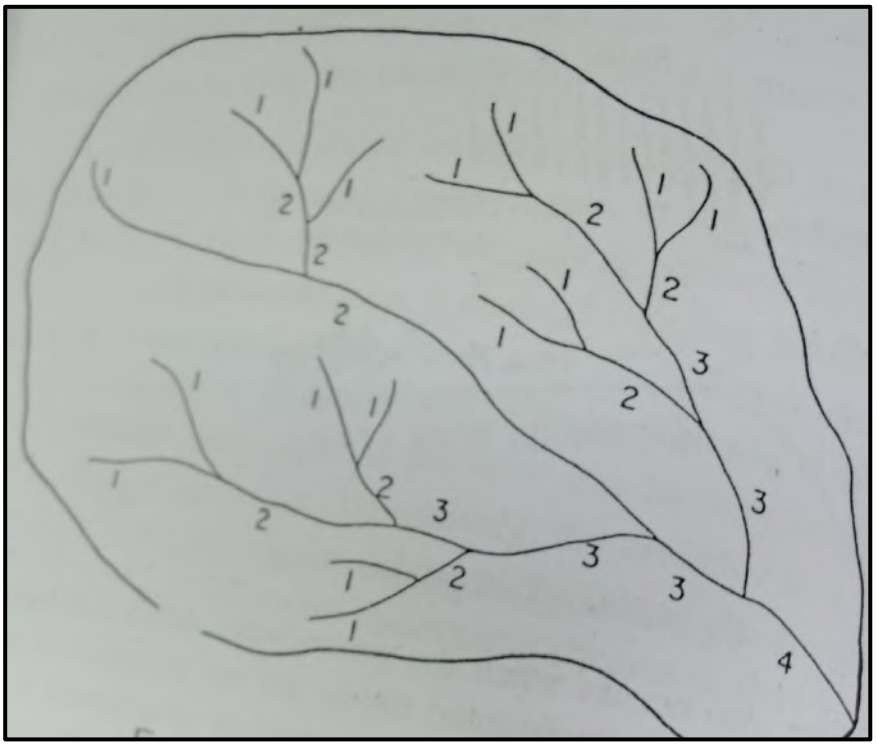

Figure 5-1: Stream ordering

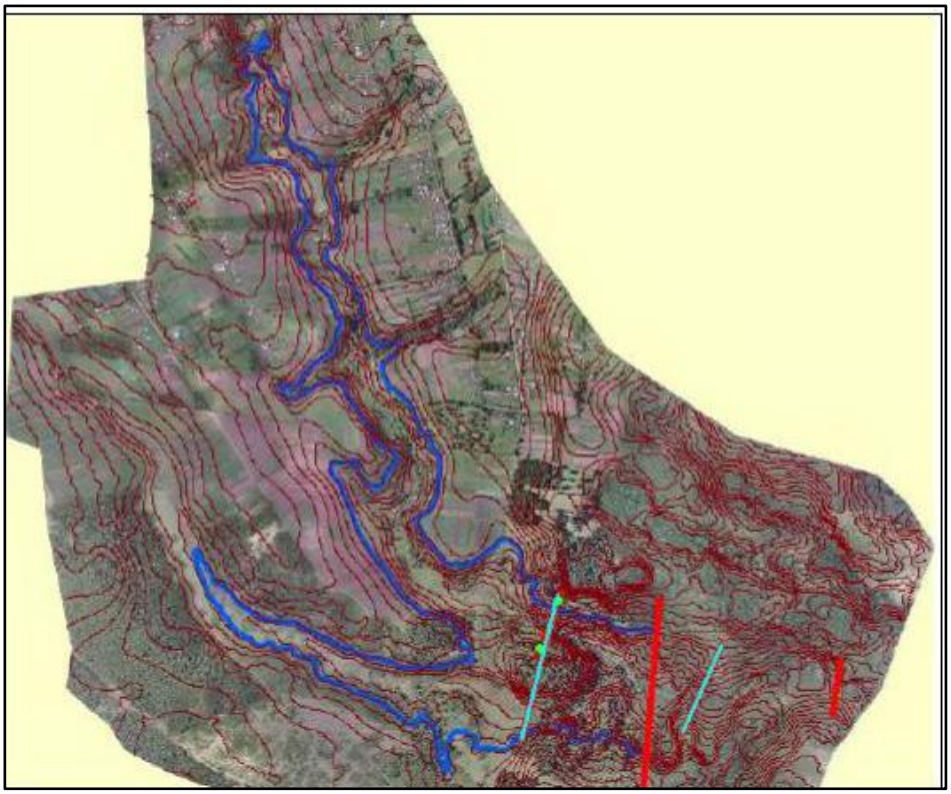

Figure 5-2: Upper Gatamayu River profile

5.2 Geology and Soils

Geologically, the Gatamayu River subcatchment lies in the Middle Pleistocene to Pliocene geological zone with pyroclastic rocks, with intercalated Laikipian–type basalt. This is the dominant geological formation in Kiambu County and part of Murang'a County.

The soils in the Gatamayu River subcatchment comprise of mainly three types namely;

- Soils developed on pyroclastic rocks and are well drained, very deep, dark reddish brown to dark brown, very friable and smeary, silty clay loam, with a humic topsoil. These mollic andosols are found in the upper reaches of the subcatchment including the river sources upstream of Kinale Forest Station and the proposed dam location;
- Soils developed on olivine basalts and ashes of major older volcanoes, and are well drained, very deep, dark reddish brown to dark brown, very friable and smeary, clay loam to clay, with a thick, acid humic topsoil; in places shallow to moderately deep and rocky. These soils are found on mountains and major scarps with slopes exceeding 30%. These soils are found mainly in the existing forest;
- Soils developed on Tertiary basic igneous rocks that comprise olivine basalts, nepheline phonolites with inclusion of older basic tuffs. These soils of the plateau and upper level uplands which are adjacent to the mountainous soils and extending to downstream of the confluence of Gatamayu River and Ruiru River comprise basically two types in the subcatchment, namely;
  - In the upper reaches adjoining the Andosols of the mountain ranges, the soils are well drained, extremely deep, dark reddish brown to dark brown, friable and slightly smeary clay, with an acid humic topsoil.
  - In the lower reaches of the subcatchment including the supply area, the soils are well drained, extremely deep, dusky red to dark reddish brown, friable clay, with an acid humic topsoil. These soils are found on the eastern lower slopes of Aberdare Mountain Ranges where Gatamayu River discharges into Ruiru River.

6.0 Details of Vegetation and Land Use

The Gatamayu River subcatchment lies within the humid to sub-humid agro-climatic zone classification in Kenya, and as such, the agricultural potential for the area is high. Extensive areas of these zones in central region of the country are under intensive small-scale agriculture where maize and beans are the main subsistence crops grown.

However, in the Gatamayu River subcatchment, the region is divided into three zones:

- The upper zone including parts of the river source, the area is settled by small-scale farmers who concentrate in the production of vegetables including, Irish potatoes, peas, cabbages, carrots, capsicum, etc;
- The middle zone is the virgin forest zone with no human activity;
- The lower zone and outside the existing forest zone on the eastern side, small-scale tea farms comprise the cash crop grown in the area. Livestock rearing is also an important economic undertaking with the farmers keeping one to three grade cows. In addition, growing of Napier grass for commercial purposes is undertaken by some farmers. Other activities include poultry keeping and piggery.

7.0 Details of Registered and Non-Registered Abstractions

Available water abstraction data from Gatamayu River system indicates that there are about 81 water abstractors authorized to abstract water from Gatamayu River and its tributaries for domestic and irrigation purposes. The records indicate that 1,699.5313 m^3/day of water is authorized for abstraction from normal flow for domestic and industrial use while 31,667.496 m^3/day of water is authorized for abstraction from flood flow. These abstractions comprise all abstractions from Gatamayu River and its tributaries. The water abstraction permit database provided by WRA is appended as Appendix 4. Perusal of the database indicates the need to update through an abstraction survey of the river system.

On illegal abstractions, the community in this subcatchment has not gone into intensive water use and illegal abstractions are negligible. In particular, the project area lies in a wet humid zone and farmers grow their crops without an irrigation component.

8.0 Details of all other Permits related this Application

The current application is a request for authorisation to construct a 26m high Kinale Dam on Gatamayu River at coordinates 37 M 0237558, 9898311 (E036.64186^0, S00.91922^0) at an elevation of 2560masl;
From the reservoir created by the dam, the project will apply for a water abstraction permit to abstract 4,000 m^3/day of water for supply in the western parts of Kiambu County comprising Lari, Limuru and Kikuyu Sub-Counties. However, water abstraction from the reservoir is dependent on the operational rules of the dam and is not related to the unregulated flow of the river.

9.0 Hydrological Characteristics and Analysis

Gatamayu River is a perennial river in the Ruiru River watershed. The river originates from the higher slopes of the Aberdare Mountain Ranges at an altitude of about 2620 meters above sea level and confluences with Ruiru River near Komothai Market Centre on the eastern side of the Kikuyu Escarpment Forest.
The flow regime of Gatamayu River, as with other rivers in the equatorial region, is rainfall dependent and experiences two rainfall seasons with the annual migration of the Inter-Tropical Convergence Zone (ITCZ) and these are reflected directly in the river regime.
The water quality of Gatamayu River is good for many purposes including domestic, irrigation and livestock watering. However, the excision of part of the forest in the upper zones of the subcatchment has played a major part in the deterioration of the river water quality. Consequently, water from the reservoir will require treatment before it is supplied to the communities.

9.2 Surface water availability

Gatamayu River is a perennial river which is fed by numerous streams, springs and groundwater recharge in the Aberdare Forest. The River used to be gauged on the eastern edge of the forest at RGS 3BC20 located at coordinates 37 M 0243717, 9891214 (E036.69714^0, S00.98342^0) at an elevation of 2211 m.a.s.l.

RGS 3BC20 operated from 1962 to 2006 when the station was abandoned. Perusal of mean monthly discharge records at RGS 3BC20 for the available period does not show any major variation between the earlier period and the latter period. As a result, the complete record has been used in the analysis.
Table 9.0 depicts the long-term mean monthly flow for the river as analyzed from records at RGS 3BC20. These results are graphically depicted in Figure 9-1. Gatamayu River at RGS 3BC20 has a mean annual flow of 0.540 m^3/s equivalent to 17.03 million cubic metres.

Table 9.0: Gatamayu River: Mean monthly discharge at RGS 3BC20

Month	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Q (m^3/s)	*0.358*	*0.277*	*0.243*	*0.941*	*1.639*	*0.814*	*0.421*	*0.292*	*0.196*	*0.235*	*0.538*	*0.528*

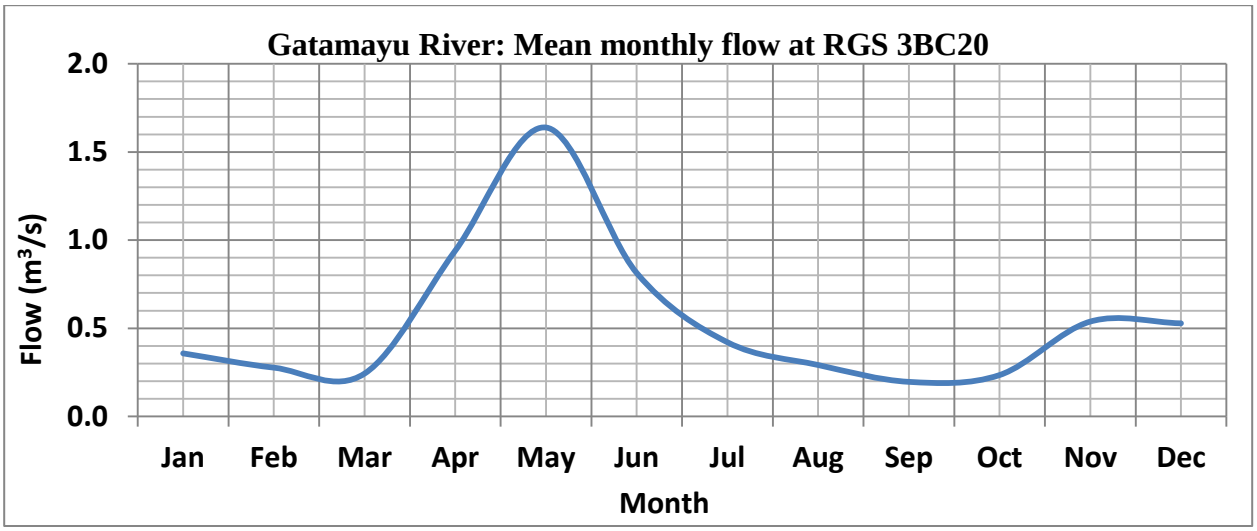

Figure 9-1: Gatamayu River: Mean monthly discharge at RGS 3BC20

9.3 Availability of surface water resources at project dam location

The estimation of flow at the Kinale Dam Site 1 on Gatamayu River is based on ratio of the drainage areas between the ungauged location at the dam and the gauged location at RGS 3BC20. This method is applicable in areas which are hydrologically homogeneous. The catchment area upstream of RGS 4BE04 is 33.3 km^2 while the catchment area upstream of the Gatamayu River Dam is 10.2 km^2.

The discharge at the dam is estimated as:

$$Q_{dam} = Q_{RGS} * (A_{dam}/A_{RGS}) \ (m^3/s)$$

Where:

Q_{dam} – Discharge at the dam;

Q_{RGS} – Discharge at gauging station;

A_{dam} – Catchment area upstream of dam;

A_{RGS} – Catchment area upstream of gauging station.

Table 9.1 and Figure 9-2 depict the estimated mean monthly discharge through the project intake. Gatamayu River at the proposed dam axis has an estimated mean annual flow of 0.167 m^3/s equivalent to 5.26 million cubic metres.

Table 9.1: Gatamayu River: Estimated mean monthly flow at proposed Kinale dam Site 1

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flow (m^3/s)	0.111	0.086	0.075	0.292	0.508	0.252	0.130	0.090	0.061	0.073	0.167	0.164

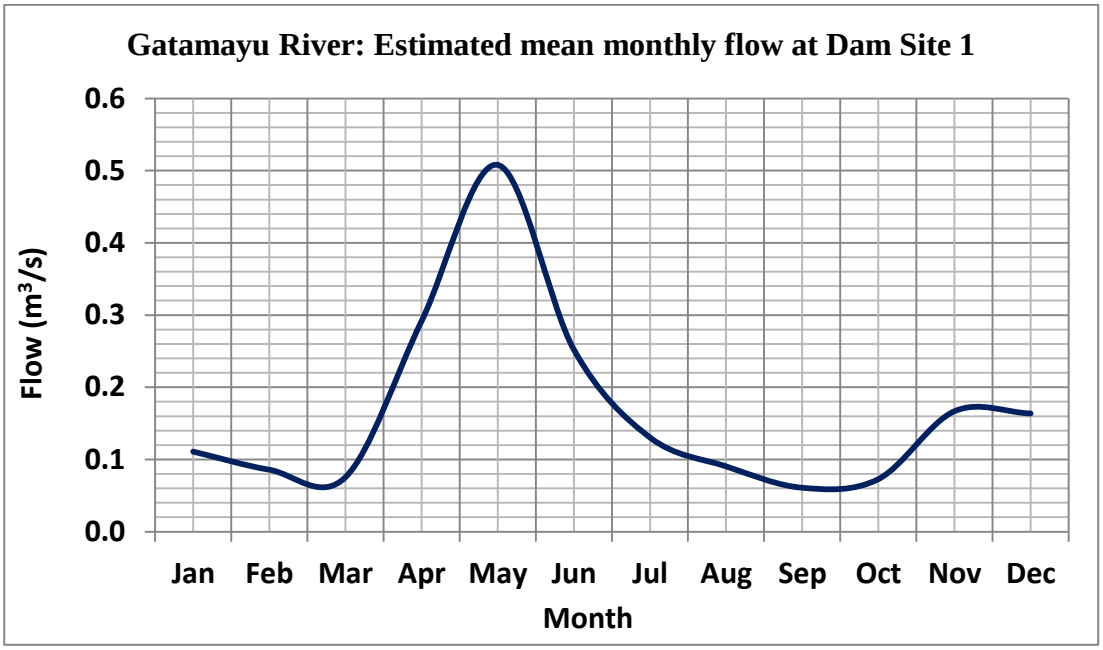

Figure 9-*2: Gatamayu River: Estimated mean monthly flow at Proposed Dam 1*

9.4 Availability of flow for storage

Analysis of rainfall records at Kereita/Kinale Forest Station indicates that the long rains are received in the months of March to May while the short rains occur from October to December. Concurrent analysis of flow data at RGS 3BC20 indicates that rainfall input to flow occurs from April to June and from November to January.

From these observations, the two periods April to June and November to January have been selected as the most appropriate periods for harvesting the runoff for storage in the Kinale Dam as it is expected that due to the availability of rainfall, there is negligible water abstraction for other purposes, thus the water is available for storage. Further, bank storage is released during the months of June and January and as such, these two months are also included in the runoff harvesting cycle. The estimated flow volumes at the Kinale Dam during these periods are summarised in Table 9.2. The analysis indicates that 3.938 million cubic metres of water would be harvested in a year during these periods.

Table 9.2: Estimated monthly flow volumes at Kinale Dam during the rainy season

Month	Monthly flow volume (10^6) m^3	Month	Monthly flow volume (10^6) m^3
April	0.756	November	0.432
May	1.361	December	0.438
June	0.654	January	0.297
Total	**2.770**	Total	**1.168**

9.5 Catchment yield

Gatamayu River is a perennial river whose flows are generated from surface runoff resulting from excess rainfall in the forested areas of the Kikuyu Escarpment Forest.

For comparison purposes, the runoff for Gatamayu River is estimated from the rainfall, where runoff is the balance of rain water which flows over the natural ground surface after abstractions by evaporation, interception and infiltration.

The annual yield of a catchment is the net quantity of water available for storage for the purposes of water resources utilisation and planning, like water supply, etc.

A rational approach to the estimation of the catchment yield is to assume a suitable runoff coefficient – C:- a dimensionless coefficient relating the amount of runoff to the amount of rainfall received.

The catchment yield is given by the following expression:

Catchment Yield = CAP

Where:

C – Runoff coefficient

A –Catchment area

P – Mean annual rainfall

Noting that rainfall will vary from year to year, and rather than using the average annual rainfall, a dependable level of 80% of rainfall has been selected. This is the depth of rainfall that can be expected 4 years out of 5 years.

Flow duration analysis of annual rainfall series at Kereita/Kinale Forest Station No. 9036191 gives an 80% dependable rainfall of 891.7mm.

Assuming a runoff coefficient of 0.45 (*Forest/cultivated land zone*), 80% dependable rainfall of 891.7mm and a cacthment area of 10.2 km^2, the Gatamayu River catchment yield is ***4.092 x 10^6 m^3.***

The runoff coefficient table for rural areas is appended as Appendix 2.

9.6 Flow duration analysis

To assess the availability of water resources for the purposes of allocation, flow frequency analysis establishing frequency of occurrence of specific river flows are undertaken. In this case, flow duration analysis using the discharge data available at RGS 3BC20 was undertaken. The analytical results were then transposed to Kinale Dam Site 1.

In flow duration analysis, naturalized or present-day historical discharge records are analyzed over specific durations to produce curves displaying the relationship between the range of discharges and the percentage of time each of them is equaled or exceeded. This analysis establishes the catchment yields at various percentage reliabilities upstream of the gauging station with particular emphasis on the 95%, 80% and 50% reliability yields.

The water resources management rules define flood flow as any flow that exceeds the Q_{50} flow value, i.e. the flow that is equaled or exceeded fifty percent of the time, and, normal flow as that flow which is less than the Q_{80} flow value.

The Q_{95} flow value currently represents the Reserve, i.e. that quantity and quality of water required to satisfy basic human needs for all people who are or may be supplied from the water resource and, for the protection of aquatic ecosystems, in order to secure ecologically sustainable development.

The flow duration analysis for Gatamayu River at RGS 3BC20 for the period 1962 to 2006 is shown in Table 9.3 while the flow duration curve is depicted Figure 9-3.

Table 9.3: Gatamayu River: Flow duration analysis at RGS 3BC20

Probability of Exceedance (%)	Discharge (m^3/s)
1	4.104
5	2.197
10	1.302
15	0.915
20	0.708
25	0.543
30	0.451
35	0.383
40	0.320
45	0.275
50	0.242
55	0.213
60	0.188
65	0.165
70	0.145
75	0.123
80	0.103
85	0.086
90	0.067
95	0.049
98	0.032

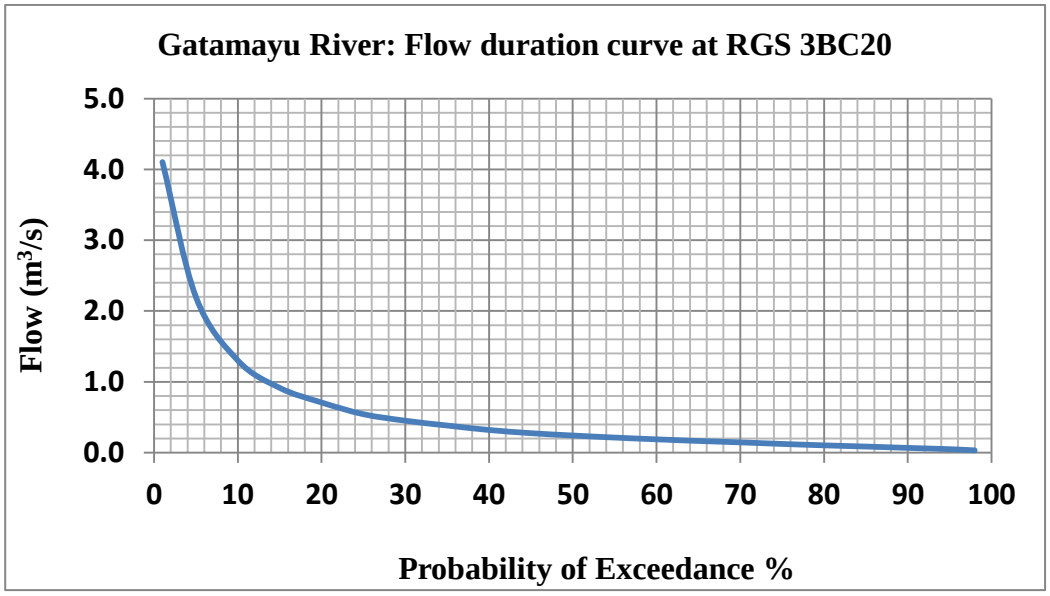

Figure 9-3: Gatamayu River: Flow duration curve at RGS 3BC20

Based on catchment area ratio, the flow duration analysis at the proposed Kinale Dam Site 1 is summarised in Table 9.4 and Figure 9-4.

Table 9.4: Gatamayu River: Estimated flow duration analysis at proposed Kinale Damsite 1

Probability of Exceedance (%)	Flow (m^3/s)
1	1.2722
5	0.6811
10	0.4036
15	0.2837
20	0.2195
25	0.1683
30	0.1398
35	0.1187
40	0.0992
45	0.0853
50	0.0750
55	0.0660
60	0.0583
65	0.0512
70	0.0450
75	0.0381
80	0.0319
85	0.0267
90	0.0208
95	0.0152
98	0.0099

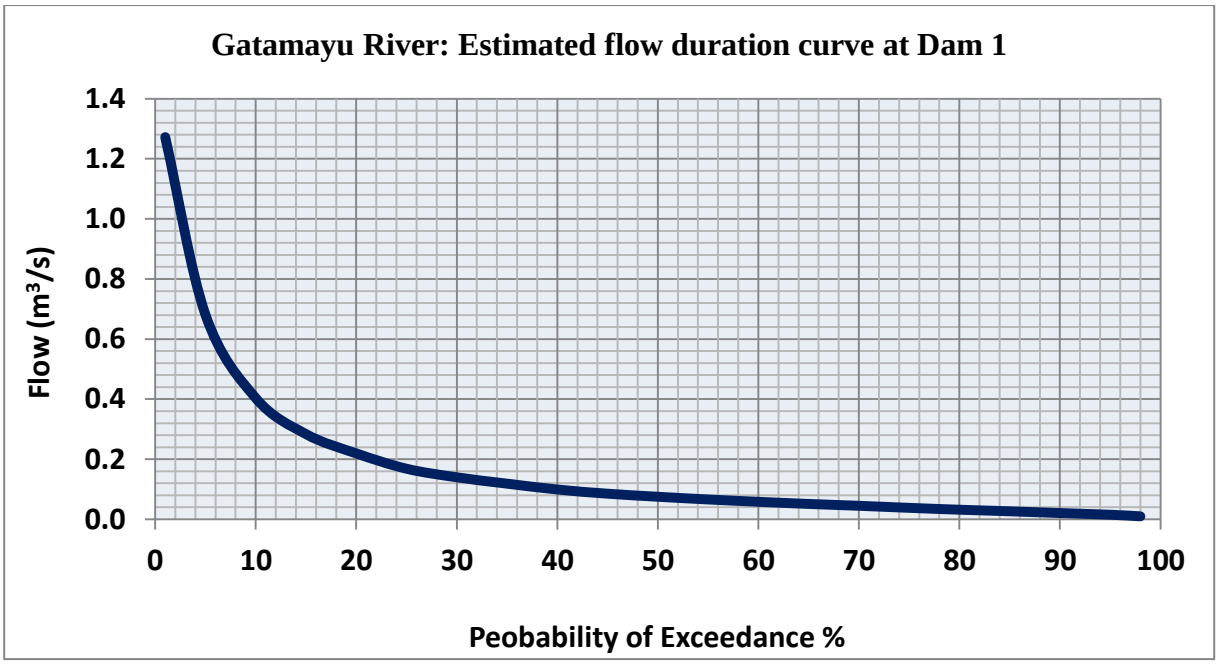

Figure 9-4: Gatamayu River: Estimated flow duration curve at proposed Kinale Dam

10.0 Hydrochemistry of Gatamayu River

The Gatamayu River was sampled at the proposed Dam site 1 on 9th October, 2020. The water quality results indicates that most of the physical and chemical parameters are within the allowable Kenyan and WHO standards except colour, turbidity, suspended solids and iron which have high levels.
The laboratory results are appended as Appendix 3.

11.0 Analysis of the Reserve

The Water Resources Management Rules 2007 defines the Reserve Flow as the portion of the water resources which is set aside to meet demands for ecological and basic human needs.
The Reserve flow (quantity) is defined as the follows:

- For perennial rivers/streams, the Reserve Quantity shall not be less than the flow value that is exceeded 95% of the time as measured by a naturalised flow duration curve at any point along the water course, or as determined through utilisation of reliable historical records when abstractions were significantly less than at present;
- For lakes and naturally occurring stagnant waters, the Reserve Quantity shall not be less than the water volume that is exceeded 95% of the time as measured by a naturalised volume duration curve or in the absence of bythymetric data, a naturalised level duration curve;
- For aquifers, the Reserve Quantity shall be 40% of the mean annual aquifer recharge in the case of aquifers whose recharge rates have been determined by the Water Resources Authority;
- For aquifers whose recharge rates have not been determined by the Authority, the Reserve Quantity for each point of abstraction shall be 40% of the tested yield expressed in cubic metres per day as determined by test pumping analysis.

From the flow duration analysis of Gatamayu River at the intake, the Q_{95} works out at 0.0099 m^3 per second equivalent to 855.36 m^3/day. Under the current development, the reserve flow would be required immediately downstream of the dam as there are more tributaries discharging into the river farther downstream.

11.1 Compensation Flows from on-line storage structures

Essentially, the compensation flow should be equal to or exceed the Reserve flow plus downstream water allocations. In the case of a dam whose total storage is a significant proportion of the mean annual volume (>30%), the storage structure has the capacity to significantly impact the downstream hydrology. *In this case, a detailed study is required to determine the downstream flow compensation requirements, particularly during the initial impoundment period. The study calls for a water abstraction survey, an assignment that is beyond the terms of reference for the current hydrological assessment study.*
Notwithstanding the above requirement, the proposed Kinale Dam will be located on what is essentially an order 1 stream with a reservoir capacity of 1.33 million cubic metres. With an estimated mean annual discharge of 5,266 million cubic metres through the dam axis, there would be negligible impact on downstream users. This is further confirmed by noting that a mean annual flow of 17.03 million cubic metres pass through the gauging station at RGS 3BC20 by the time the river segment is of order 4.

12.0 Assessment of Availability of Flow

From the flow duration analysis of Gatamayu River at the proposed Kinale Dam, the water available for allocation for domestic and industrial purposes from the normal flow would be the difference between Q_{80} and Q_{95} amounting to 0.0167 m^3/s equivalent to 1,442.88 m^3/day. Since there are no allocations upstream of the proposed dam location, this amount of water is available for allocation without storage facilities.
However, the project intends to develop a 1.33 Mm^3 capacity reservoir which will be the source for the 4,000 m^3/day abstraction.

12.1 Area-Capacity Curves

Area-capacity curves are usually used for reservoir flood routing, reservoir operation, determination of water surface area, and capacity corresponding to each elevation, reservoir classification, and reservoir sediment distribution. In this study, area-capacity curves were utilized to estimate capacity corresponding to each elevation.

The Athi Water Works Development Agency intends to construct a 22m high dam at the intake. The volumes and areas of the Contours at the dam as extracted from high resolution aerial mapping using UAV (Unmanned Aerial Vehicle) and the results are summarized in Table 12.0. The results indicate that a 22m high dam would create a reservoir of over 1.8 million cubic metres.

Table 12.0: Gatamayu River: Volume-Contour data for Dam 1

CONTOUR	2D AREA M^2	3D AREA M^2	VOLUME M^3
2,567	193,159	206,737	1,865,358
2,566	181,728	194,252	1,677,875
2,564	158,996	169,422	1,337,139
2,562	135,762	144,158	1,041,755
2,560	110,978	117,501	790,933
2,558	89,163	94,112	589,198
2,556	73,230	76,936	426,278
2,554	60,666	63,363	292,333
2,552	44,825	46,633	180,413
2,550	31,878	32,989	106,321
2,548	21,821	22,379	51,773
2,546	10,399	10,559	15,334
2,544	0	0	0

13.0 Impacts of Proposed Activity on Flow Regime, Water Quality and Other Abstractions

The construction of Kinale Dam with a 1.8Mm^3 storage reservoir will ensure availability of flow for abstraction without affecting the normal flow of the river, its water quality and other abstractions downstream.

14.0 Recommendations on Proposed Activity

An important purpose of water resources management is to balance the water demand with its availability through suitable water allocation arrangements. It is recognized that this balancing of water demand with water availability is catchment specific and the water allocation process requires a sound quantitative and qualitative understanding of both water availability and water demand.

The hydrological assessment of Gatamayu River has established the water available in the subcatchment for allocation. The assessment shows that the current water resources are not adequate to meet the water demand and the need to construct storage facility.

In this regard, it is recommended that the Athi Water Works Development Agency:

i) Be authorized to develop the 22m high Kinale Dam on Gatamayu River at the location identified by coordinates 37 M 0237558, 9898311;

ii) The Agency be authorized to abstract 4,000 m^3/day of water for public supply from the established reservoir;

iii) The Agency should implement water demand management measures to improve water use efficiency by reducing wastage and thus minimize the water abstraction from the river.

15.0 Design Flood Discharges

15.1 Flood prediction methods

The methods frequently used for design flood analyses are summarised hereunder:

15.1.1 Flood frequency studies

Where flood flow data are available for a river at or near the proposed site of interest, the data is analysed using the various available statistical methods to estimate the design floods of various return periods. The statiscal methods commonly used include, Gumbel Extreme Value Distribution, Log-Pearson Type 3 Distribution, the Log-Normal Distribution, etc.

15.1.2 Flood transposition

Where records are not available at the proposed site but are available for another point on the river or on an adjacent and similar river, estimates for the design flood are made using flood transposition.

15.1.3 Empirical methods

These methods include:

- formulae that take only the catchment area into consideration,
  e.g; Dickens formulae, $Q = C*A^{3/4}$
- formulae that take one or more catchment parameters apart from area and also rainfall characteristics into consideration;
- formulae that take recurrence interval either explicitly or implicitly into consideration

15.1.4 Deterministic methods

These methods derive flood flows from catchment rainfall and include:

- The Rational method;
- The TRRL East African Flood Model/The Generalised Tropical Flood Model;
- The SCS Peak Flow method.

15.2 Frequency analysis of design flood

Frequency analysis makes use of the observed data in the past to predict the future flood events along with their probabilities and return periods. It is based on the assumption that the combination of the numerous factors which produce floods are a matter of pure chance and therefore are subject to analysis according to the mathematical theory of probability.

Flood frequency analysis entails the estimation of peak discharges which are likely to be equaled or exceeded on average once in a specified period of T years. Thus a peak discharge Q_T has a return period or recurrence interval of T years. The return period, T years, is the long–term average of the intervals between successive exceedances of a flood of magnitude Q_T.

15.3 The Generalised Tropical Flood Model

The Generalised Tropical Flood Model is a rainfall-runoff model developed by *D. Fiddes at el* for the tropics and combines the merits of the East African Flood Model developed by the Transport and Road Research Laboratory (TRRL) by D. Fiddes and the ORSTOM Model developed for West Africa. The model is applicable in all areas of the tropics where locally validated alternatives are not available.

The design flood method comprises the following:

(i) Estimate the catchment area and the longest channel slope;
(ii) From catchment site inspection, establish the catchment type and estimate the surface cover flow time;
(iii) From catchment site inspection and relevant tables, establish the soil permeability class and the slope class from where the basic runoff coefficient (C_s) is estimated;
(iv) From relevant tables, estimate the land use (C_L) and the catchment wetness (C_w) factors;
(v) The runoff coefficient C_A is estimated as, $C_A = C_s C_L C_w$;
(vi) Estimate the hydrograph base time;
(vii) Calculate the design storm rainfall depth (P) of the required recurrence intervals to be allowed during the hydrograph base time;
(viii) Calculate the average discharge during the base time;
(ix) The average discharge is multiplied by a peak flow factor to give the design peak discharge.

15.3.1 Determination of model coefficients

The hydrograph base time

Base time, $T_B = (CA^{1/2}/S^2) + T_s$

Where:

T_B - the hydrograph base time in hours;
A - the catchment area (km^2);
S - the slope class;
T_s - the lag time (an adjustant to allow for surface cover effects)
C - a constant which is 20 for arid and semi arid catchments and 30 for humid catchments.

Contributing area coefficient

A contributing area coefficient (C_A) is adjusted for land use and catchment wetness by multiplying the appropriate standard value contributing area coefficient for a grassed catchment at field capacity (C_s), the catchment wetness factor (C_w) and the land use factor (C_L).

$$C_A = C_s C_w C_L$$

Rainfall intensity

The rainfall intensity to be used in the prediction of flood discharge is calculated using the TRRL method, given by rainfall in time , t,

$$\mathbf{R_t = t/24\{(24 + b)/t + b)^n * R_{daily}},$$

The rainfall ration is given as;

$$\mathbf{RR_t = t/24\{(24 + b)/(b + t)\}^n}$$

The rainfall intensity across the catchment is given by:

$$\mathbf{I = P_T = RR_T * ARF * R_{daily}\ (Y_T)}$$

Where:

b and n are constants

R_{daily} - the 24-hr-rainfall of appropriate return period;

ARF – the area reduction factor, given by;

$ARF = 1- 0.044A^{0.275}$

Average catchment flow

The average catchment flow is given by:

$$Q_a = C_A P_T\ A/360T_B$$

The design flood is computed by multiplying the average catchment flow by a Peak Flow Factor (PF):

$$Q_p = PFQ_a,$$

Peak flow factors are summarised in Table 13.0:

Table 13.0: Peak flow factors (PF)

Type of catchment	Peak flow factor
Arid zone	3.0
Humid zone	2.5
Forest	1.7

15.3.2 Design flood analysis at Kinale Dam

For Kinale Dam on Gatamayu River, the river has its sources in a partly settled area at an elevation of about 2620masl.

Details of Gatamayu River:

Catchment area: 10.2 km^2

Channel slope – 1.23%

Slope class - 3

Channel length: 6.5 km

Catchment type: forest/cultivation

Fairly permeable soils, I = 4

$C_S = 25\%$

$C_L = 1.5$

$C_w = 1.0$

$C_A = C_S * C_L * C_W = 37.5\%$

$T_B = CA^{0.5}/S^2 + T_S$

T_S = 1 Hrs (Steep forest)

C = 30 (humid zone)

$T_B = \mathbf{(CA^{1/2}/S^2) + T_s}$

T_B = 11.6Hrs

Rainfall Ratio, RR_T,

$RR_T = T/24\{(b+ 24)/(b + T)\}^n$

For nay T_B>8hr, T_B = 8hrs

b = 0.3

n = 0.96 (inland zone)

R_T = 0.88

$ARF = 1 – 0.044A^{0.275}$

ARF = 0.92

$P_T = R_T * ARF*Y_T$

Where,

Y_T – 24-hr rainfall with a return period of T years

Summary of design parameters:

A. Gatamayu River catchment parameters

Catchment area (km^2)	Stream length (km)	Slope (%)	Slope Class (S)	Soil Class (I)	FLOOD PARAMETERS				Base Time (T_B)	Rainfall Ratio (RR_T)	Area Reduction Factor (ARF)
					C_S	C_W	C_L	C_A			
10.2	6.0	1.23	3	4	25	1.0	1.5	37.5	11.6	0.88	0.92

B. Design storm rainfall depth (Y_T) (Kinale Forest rainfall station)

Return Period	10	25	50	100	500	1000	10000
Rainfall	101.4	121.6	137.1	153.0	192.0	206.5	259.2

C. Design rainfall intensity ($P_T = R_T * ARF * Y_T$)

Return period	10	25	50	100	500	1000	10000
Rainfall (mm)	82.1	98.4	111.0	123.9	155.4	167.2	209.8

D. Design flood discharges $\{Q_P = (C_A*P_T*A)/(360*T_B)\}*PF$

Return Period	10	25	50	100	500	1000	10000
Design flood	18.80	22.54	25.42	28.36	35.59	38.28	48.05

15.4 Adaption to climate change effects

Recent studies on Rainfall-Runoff Modeling undertaken by the Water Resources Authority and other institutions under the project "Building Adaptive Capacity to Climate Change in Kenya" and funded by the Nordic Climate Facility, estimated that annual runoff will increase by an average of 12.5% between 2020 and 2049, a period referred to as "Near Future", and, increase by an average of 43.4% between 2070 and 2099, a period referred to as "Far Future".

In order to ensure that the development of Kinale Dam is protected from the expected climate change impacts, the computed design floods have been increased by 30%. The higher design flood levels ensure the safety of the dam under extreme climatic events in the future. The revised design flood discharges are depicted in Table 13.1.

Table 13.1: Gatamayu River: Design flood discharges at Kinale Dam

Return Period	10	25	50	100	500	1000	10000
Design flood	24.44	29.31	33.04	36.87	46.27	49.77	62.47

16.0 Reservoir Sedimentation

16.1 Introduction

All water that reaches a river and its tributaries carries sediments eroded from the entire drainage area. The total amount of erosional debris eroded from the drainage basin is its sediment yield.

The sediment delivered to and transported by a river is its sediment load. The sediment load is classified into three classes, namely:

- The bed load - The coarsest sediment, consisting of boulders and cobbles as well as sand, moves on or near the bed of the river;
- The suspended load - the finer particles, silts and clays, that are carried in suspension by the turbulent action of flowing water;
- The dissolved load - composed of chemical compounds taken into solution by the water moving on or in the soils of the drainage basin.

The ultimate source of the sediment that is measured as sediment yield is the rock underlying the drainage basin. Until the rock is broken or weathered into fragments of a size that can be transported from the basin, the sediment yield will be low.

Of greatest concern to the human society are the factors that cause rapid rates of erosion and high sediment yields. The quantity and type of sediment moving through a river channel are intimately related to the geology, topographic character, climate, vegetation type and density, and land use within the drainage basin. The geologic and topographic variables are fixed, but short-term changes in climatic conditions, vegetation, and land use produce abrupt alterations in the intensity of erosion processes and in sediment yields.

When the sediment laden water of the stream enters the reservoir, the velocity and turbulence are greatly reduced. Therefore, its ability to entrain sediment is substantially impaired and the sediment deposition takes place in the reservoir. First, the deposition of the coarse sediments takes place in a delta near the entrance to the reservoir. In the course of time, this delta grows in the direction of the dam until it eventually fills the entire reservoir volume. Fine sediments which remain in suspension can be carried through to the dam and eventually settle in the deepest part of the reservoir. The fine sediments which are deposited near the dam may be flushed out by opening the scour sluices of the dam. Figure 14-1 depicts the sediment deposition process in a reservoir.

The sediment deposition in reservoirs is of considerable economic and practical importance since it reduces the storage capacity of the reservoir. The design life of a reservoir is the period required for the reservoir to fulfill its intended purpose. Due to reservoir sedimentation, provision must be made to guarantee the full design reservoir storage capacity for the planned design life. This necessitates either the cleaning out the reservoir sediments at predetermined intervals of time during the life of the reservoir or providing a reservoir capacity large enough to store all accumulated sediment deposits without affecting the useful storage. In either case, calculation of sediment deposition rates becomes part of the design of reservoir storage projects.

Suitable sites for large reservoirs do not occur frequently and the completed works are very valuable assets which must not be allowed to deteriorate. Unfortunately, reservoirs act as efficient sediment traps for the soil eroded by rain from the cultivated areas of the catchment and brought down by the flood waters. Sediment deposition in reservoirs leads to loss of storage capacity and increased operation and maintenance costs at the water intakes, causing water shortages and unreliability of water supply systems. The cost of removal of such sediments is prohibitive especially if deposited in large quantities. The provision of sediment traps is no substitute for proper precautions against erosion because the regular removal of sediment is a formidable task

which if neglected, would mean that the sediment would reach the reservoirs in much the same quantities as if the sediment trap had not been there.

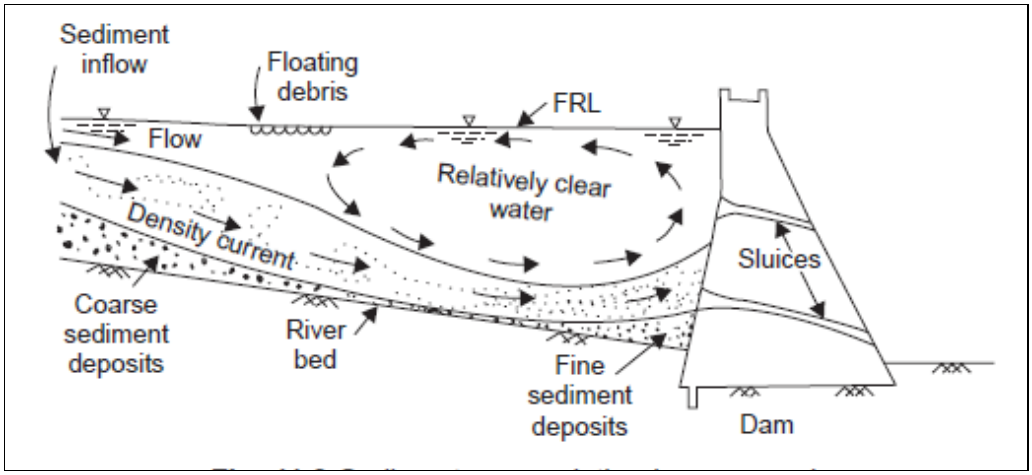

Figure 14-1: Sediment accumulation process in a reservoir

16.2 Kinale Dam catchment

Within the upper Gatamayu River subcatchment area, it is observed that the majority of the catchment area has become agricultural land and it is therefore very advantageous and economically desirable to reduce the rate of erosion within the catchment by use of appropriate soil and water conservation methods. It is anticipated that the forest reserve in the upper catchment will be preserved.

Population growth in the local market centres such as Kinale will continue to grow and this might lead to an increase in flood potential and sediment run-off. Fortunately, the ongoing rehabilitation of Kinale forest will ensure the conservation of the catchment area.

There is general lack of sediment load data for most rivers in Kenya including the Gatamayu River. The sediment load records held by the Ministry of Water and Irrigation and the Water Resources Authority do not contain any sediment load sampling and analysis from the upper reaches of Gatamayu River.

However, studies on sediment load analysis undertaken during the 1992 Study on the "National Water Master Plan" estimated a denudation rate of 350 m^3/km^2/year in the upper Tana River system. In the absence of updated data on sediment loading, it is recommended that the production of 350 m^3/km^2/year be applied for Kinale Dam.

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8. Water Resources Managemnt Authority: Guidelines for Determination of Permit Classification for Water Storage Structures, 2009;
9. Water Resources Management Authority: Guidelines for Water Allocation;
10. Water Resources Management Authority: Water Resources Allocation Thresholds for Classification of Permits (2007and 2014);

APPENDICES

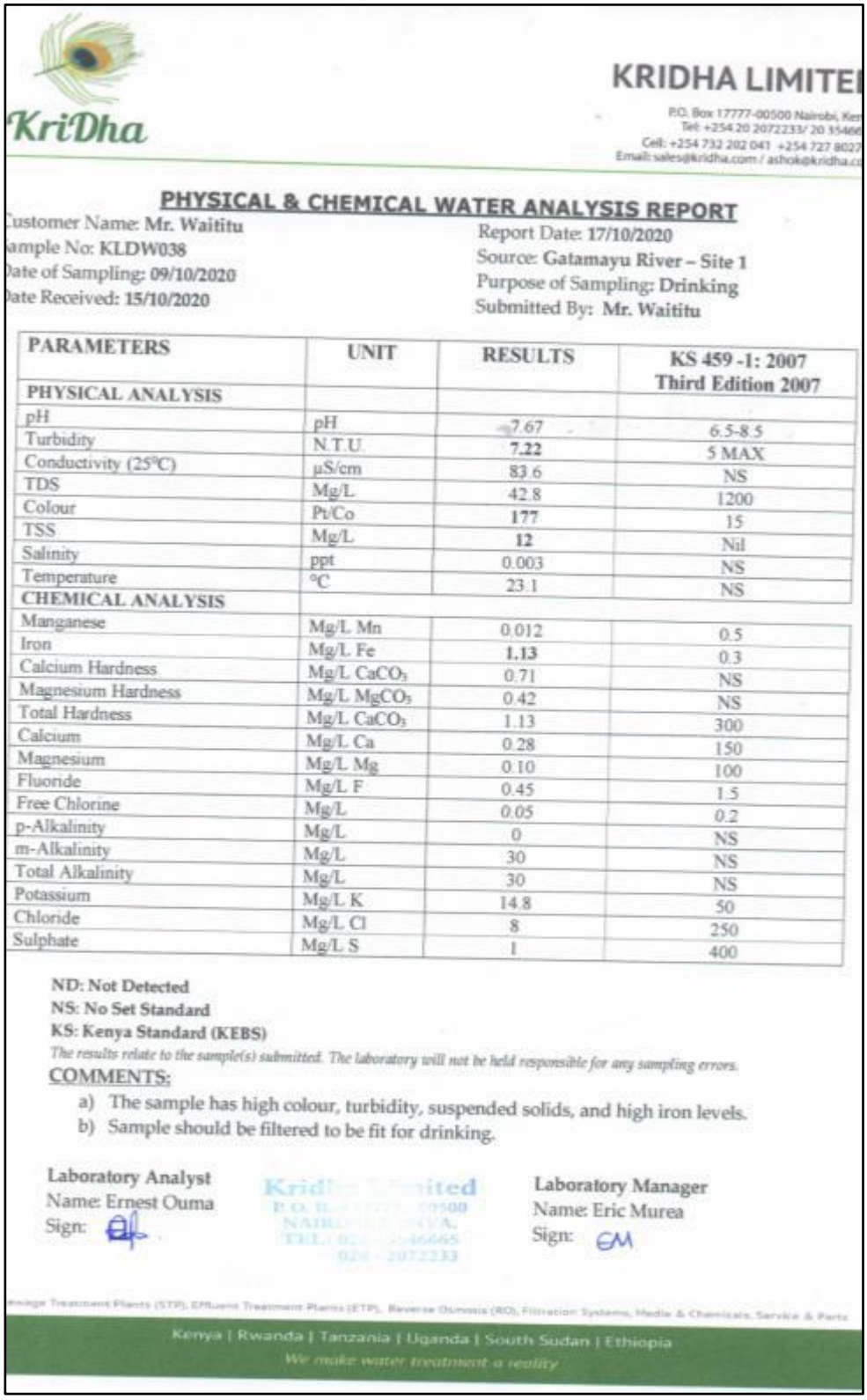
Appendix 1: Kereita/Kinale Forest Station: Monthly rainfall totals

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1970	237.7	48.8	108.3	289.3	267.6	105	31.3	45.3	38.2	72.3	94.7	14.6
1971	97.7	19.9	33.9	188.9	251.1	53.4	162.7	50.8	32.7	38.1	80.8	122.3
1972	78.6	175	52.5	69.1	161.8	137.2	4.2	24.7	35.4	277.7	86.2	62.6
1973	65.8	82.2	0	186	47.2	57.7	23	42.5	55	62	102.1	4.5
1974	18	31.6	153.3	504.6	50.5	114.1	215.5	53.9	16.1	102.2	152.2	31.2
1975	65.1	8.5	123.3	245	154.4	11.9	58.8	26.9	135.9	94.3	49.3	67.1
1976	26.5	42.1	106.1	272.9	169.5	71.6	145.5	30.5	83.3	19.8	119	36.2
1977	116.5	73	141	643.5	372.9	90.2	154.1	30.2	28.7	176	392.5	160.7
1978	133.5	80	267.5	315.4	229.5	43.1	28	22.5	27.5	44.6	61.3	92.6
1979	30.2	74.4	70.8	277	126	53	14.7	6.1	25.4	54.2	40	34
1980	43	40.4	66.2	244	513.5	54	5	45.5	31.5	112.1	329.8	96.5
1981	0	55.7	239	304.2	220.8	58	85.1	13.3	49	111.7	67.5	75.8
1982	9	37	29	253.5	364	48	29.1	14.6	51	290.7	321.2	158.7
1983	30.9	46.2	66.4	282.2	191.7	92.5	45	54.8	2.5	94.8	118.8	115.6
1984	35.2	27.9	15.7	135.2	27.5	14	26	19	23	199.6	169.4	63.5
1985	5	69	154	244.2	284.5	76	41.5	9.2	17.3	66.6	85.6	5.7
1986	22	14	110.2	305.7	235	51		8.5	18.5	100.7	160.1	87
1987	31.8	32.8	33.6	189.1	187	100.8	30.5	55.5	22.2	33.8	175.5	4.5
1988	119.3	41.8	145.1	350	159.9	58.6	45.4	51.2	34.5	54.9	106.6	75.4
1989	160.8	134.5	74.9	195.8	230	39.8		26.2	66.1	132.6	166.1	84.2
1990	109.2	93.7	161.9	227.9	203.6	30	21.1	19.4	28.2	117.1	112.9	44.2
1991	14.5	3	141.9		325.1	43.5	19.4	41.5	15	82.9	76	127.5
1992	0	50.5	66.9	343.4	108	75.5	33.5	19.3	22.9	105	145.8	88.1
1993	182.3	116.8	45.7	33.6	123.4	96.8	2	19.8	18.1	10	119.1	64.5
1994	10		102.6	264.2	320.6	66.4	35.7	45.7	9.8	164.8	338.2	55.2
1995	42.5	149	207	221	272	88	55				92	87
1996	32	95	91	164	103.5	46						

Appendix 2: Runoff coefficients for rural areas

Factor		Description	Runoff coefficient
C_s	Average slope of the catchment	<3.5% Flat	0.05
		3.5% to 10% Flat to moderate	0.10
		10% to 25%	0.20
		25% to 35% Hilly	0.20
		>35% Mountainous	0.25
C_p	Permeability of the soil	Well drained soils, eg. Sand and gravel	0.05
		Fairy drained soils, eg. Sand and gravel with fines	0.10
		Poorly drained soils eg. silt	0.15
		Impervious soil, eg. Clay, organic silt and clay	0.25
		Water logged, lack of cotton soil	0.50
		Rock	0.40
C_v	Vegetation	Dense forest/thick bush	0.05
		Sparse forest/dense bush	0.10
		Grassland/scrub	0.15
		Cultivation	0.20
		Sparse grassland	0.25
		Barren	0.30
	$C_R = C_S + C_P + C_V$		

Appendix 3: Gatamayu River: Water quality results at Dam Site 1



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PHYSICAL & CHEMICAL WATER ANALYSIS REPORT

Customer Name: **Mr. Waititu**
Sample No: **KLDW038**
Date of Sampling: **09/10/2020**
Date Received: **15/10/2020**

Report Date: **17/10/2020**
Source: **Gatamayu River – Site 1**
Purpose of Sampling: **Drinking**
Submitted By: **Mr. Waititu**

PARAMETERS	UNIT	RESULTS	KS 459 -1: 2007 Third Edition 2007
PHYSICAL ANALYSIS			
pH	pH	7.67	6.5-8.5
Turbidity	N.T.U.	7.22	5 MAX
Conductivity (25°C)	µS/cm	83.6	NS
TDS	Mg/L	42.8	1200
Colour	Pt/Co	177	15
TSS	Mg/L	12	Nil
Salinity	ppt	0.003	NS
Temperature	°C	23.1	NS
CHEMICAL ANALYSIS			
Manganese	Mg/L Mn	0.012	0.5
Iron	Mg/L Fe	1.13	0.3
Calcium Hardness	Mg/L $CaCO_3$	0.71	NS
Magnesium Hardness	Mg/L $MgCO_3$	0.42	NS
Total Hardness	Mg/L $CaCO_3$	1.13	300
Calcium	Mg/L Ca	0.28	150
Magnesium	Mg/L Mg	0.10	100
Fluoride	Mg/L F	0.45	1.5
Free Chlorine	Mg/L	0.05	0.2
p-Alkalinity	Mg/L	0	NS
m-Alkalinity	Mg/L	30	NS
Total Alkalinity	Mg/L	30	NS
Potassium	Mg/L K	14.8	50
Chloride	Mg/L Cl	8	250
Sulphate	Mg/L S	1	400

ND: Not Detected
NS: No Set Standard
KS: Kenya Standard (KEBS)
The results relate to the sample(s) submitted. The laboratory will not be held responsible for any sampling errors.

COMMENTS:

a) The sample has high colour, turbidity, suspended solids, and high iron levels.
b) Sample should be filtered to be fit for drinking.

Laboratory Analyst
Name: Ernest Ouma
Sign:

Laboratory Manager
Name: Eric Murea
Sign: EM

Kridha Limited
P.O. Box 17777-00500
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Appendix 4: Gatamayu River water abstraction database

S/No	Name of Applicant	Location				Purpose				Water abstraction from		Class
			PERMIT NO	DATE ISSUED	EXP DATE	DOMESTIC	IRRIGATION	INDUSTRY	OTHERS	Normal flow	Flood Flow	
1	CHEIF CONSERVATOR OF FOREST	GATAMAIYU	4107	9/17/1956	12/31/1981	Domestic				44.955		B
2	KARANJA MUTURI	KAGWE	1959	9/11/1964	9/30/1989				Other		4860	
3	APOLLO KIHANYA	GATAMAIYU	2058	11/22/1961	12/31/1985				Other		7290	D
4	KIAMBU COUNTY COUNCIL	KAGWE	7220	3/27/1984	12/31/1985	Domestic			Other	9.87	909.09	C
5	AFRICAN INLAND MISSION	KAGWE	4740	9/22/1962	8/31/1987	Domestic	Irrigation		Other	17.01	14580.89	D
6	CARBACID 1961 LTD	GATAMAIYU	9409	6/23/1966	6/30/1991	Domestic		Industry		9.8901		B
7	WILLIAM BABU WAWERU	GATHUGU	11401	10/16/1974	5/21/1993	Domestic	Irrigation			2.25	90	B
8	KOMOTHAI COFFEE GROWERS	KIAMBURURU	1808	3/19/1975	10/8/1993			Industry		45.44		B
9	CEPHAD NJUGUNA WAWERU	KAMUCHEGE	12448	1/30/1974	11/10/1996	Domestic				1.3486	12.15	B
10	KAGIRI MWANGI	KAMUCHEGE	13405	6/30/1982	12/31/1984	Domestic	Irrigation			1.363	9.087	B
11	PETER KAMAU KIMANI	NYANDUMA	14292	7/24/1974	2/9/1997	Domestic	Irrigation			0.8991	17.982	B
12	HARON NJENGA KARIUKI	NYANDUMA					.	Industry		22.72		B
13	SAMUEL WAINAINA NJOYA	.					.	Industry		22.72		B
14	JOSEPH NJOROGE WAINAINA	NYANDUMA	15314	8/13/1975	2/17/1978		.					
15	STANELY MIRIE	GATAMAIYU	15523	10/2/1974	2/8/1999	Domestic	Irrigation			2.2478	8.991	B
16	DANIEL KIMANI MWAURA	GATAMAIYU	15705	1/24/1979	1/12/1980	Domestic	Irrigation			1.14	9.09	B
17	DANIEL NJUGUNA KANIARU	GACHOIRE	15734	10/30/1981	3/20/1985	Domestic	Irrigation			7.363	18.174	B
18	JACKSON KAMAU MATHU	KAMUCHEGE	16639	8/18/1982	7/6/1986	Domestic	Irrigation			22.72	90.9	C
19	NJUGUNA GACHUHI	KIAMBURURU	16703	8/18/1982	12/31/1982	Domestic	Irrigation			23.6	281.7	C
20	GEORGE NGUGI K	KAMUCHEGE	16993	1/28/1981	12/30/1982	Domestic	Irrigation	Industry		1.3486	17.982	B
21	KIBE NGATHA	KOMOTHAI				Domestic	Irrigation			23.158	17.982	B
22	NJAU GOCHO	NYANDUMA	17209	3/21/1979	7/30/1982			Industry		22.75		B
23	JOSEPH MUKUNGA KIBE	NYANDUMA				Domestic	Irrigation	Industry		20.6	99	C
24	HADERSON KIRURI SIRUS	KAMUCHEGE	17260	12/6/1978	8/29/1985	Domestic			Other	0.9001	9.087	B
25	WANGARI KIMANI	KIAMBURURU	17419	6/18/1992	6/18/1993	Domestic		Industry		23.63	18.17	B

26	NGUGI NJOROGE	KOMOTHAI				**Domestic**	**Irrigation**			1.62	27	**B**
27	JOHN NJUGUNA NGANGA	NYANDUMA	17638	2/25/1983	4/18/1984	**Domestic**	**Irrigation**			0.681	18.2	**B**
28	MBURI GACHURA	KOMOTHAI				**Domestic**	**Irrigation**	**Industry**		23.4	81	**C**
29	NGANGA GATHURU	KOMOTHAI				**Domestic**	**Irrigation**	**Industry**		69.06	181.74	**C**
30	MWANGI GICHO	NYANDUMA	17718	3/24/1982	5/16/1983	**Domestic**	**Irrigation**			0.454	45.435	**B**
31	JOSEPH MBURU	KIAMBURURU	17946	5/24/1988	4/28/1993	**Domestic**	**Irrigation**	**Industry**		23.85	18.18	**B**
32	DANIEL MUNENE KABOGA	KOMOTHAI				**Domestic**	**Irrigation**	**Industry**		24.3	36	**B**
33	GACHURA MBURI	KARATINA				**Domestic**	**Irrigation**	**Industry**		23.62	54.52	**B**
34	MUGI NGATI	KIAMBURURU				**Domestic**	**Irrigation**			2.25	72	**B**
35	KAMBURU S/H PROJECT	GATAMAIYU					**.**			391.5		**C**
36	KOMOTHAI COFFEE GROWERS	KOMOTHAI				**Domestic**	**.**	**Industry**		45.435		**B**
37	WAMBUI GITHINJI	KOMOTHAI				**Domestic**	**Irrigation**	**Industry**		23.16	54.52	**B**
38	MBIGUA GACHURA	KARATINA				**Domestic**	**Irrigation**	**Industry**		24.06	45.4	**B**
39	KIRIGU WATER PROJECT	KARATINA				**Domestic**		**.**		54.52		**B**
40	MAGUGU WERU	KARATINA				**Domestic**	**Irrigation**	**Industry**		26.7	72.6	**B**
41	BERNARD MUNGAI KAMIRI	KARATINA				**Domestic**	**Irrigation**			0.908	9.08	**B**
42	DANIEL KIHARA GATHURI	GACHOIRE				**Domestic**	**Irrigation**			0.09	4.05	**A**
43	PAUL NJUGUNA KARUGA	GATAMAIYU				**Domestic**	**Irrigation**			5.85	27	**B**
44	JAMES KABAKI GACHUI	KOMOTHAI				**Domestic**	**Irrigation**	**Industry**		23.5	78.1	**C**
45	NGUGI GACHERU	GATAMAIYU				**Domestic**	**Irrigation**			0.91	27.26	**B**
46	GACHANJA KIBERA	KOMOTHAI	21172	5/24/1990	5/24/1991	**Domestic**	**Irrigation**			2.27	9.09	**B**
47	STEPHEN NGUGU SAMUEL	.				**.**	**.**					
48	GIKUBU GITAU	KOMOTHAI				**Domestic**	**Irrigation**			2.27	72.69	**B**
49	JOSEPH MBURU MAHARIA	GATAMAIYU				**Domestic**				1.82		**A**
50	WAGUCHIU NGATHA	KARATINA				**Domestic**	**Irrigation**	**Industry**		47.25	72.696	**C**
51	JAMES KIMANI KAMAU	KARENGE	22027	6/4/1990	8/15/1992	**Domestic**	**Irrigation**			1.59	45.45	**B**
52	SAMUEL NJOROGE KURIA	NYATHUNA				**Domestic**	**Irrigation**	**Industry**		32.26	63.61	**B**
53	MUIRURI LABAN	GATHUNGU				**Domestic**	**Irrigation**			6.36	90.87	**B**
54	JOHN NGUGI KARIUKI	KAMUCHEGE				**Domestic**	**Irrigation**		**Other**	21.36	36.36	**B**
55	GITU WANGANGA	KARATINA				**Domestic**		**Industry**		27.86		**B**
56	OBADIAH THUMBU ANDREW	GACHOIRE				**Domestic**	**Irrigation**			1.59	98.87	**C**

57	PETER KAMAU KIMANI	NYANDUMA				**Domestic**	**Irrigation**	**Industry**		30.1	18.17	**B**
58	GATUMA KIARIE	NYANDUMA	22755	5/6/1989	5/20/1991	**Domestic**	**Irrigation**			5.23	2.27	**B**
59	NJOROGE KAGUNDA	KAMUCHEGE				**Domestic**	**.**	**Industry**		24.99		**B**
60	NGANGA WAKAHU	GATAMAIYU				**Domestic**	**.**	**Industry**		24.99		**B**
61	DIRECTOR WATER DEVT (Githunguri WS Co. Ltd)	GATAMAIYU				**Domestic**	**.**			2/ 68663		**C**
62	MUNGAI WANJAI	GITHIORO				**Domestic**	**Irrigation**	**Industry**		7.56	22.75	**B**
63	KIMETHU WABAU	KARATINA				**Domestic**	**.**	**Industry**		36.3	91	**B**
64	NJORGE KIMUNGU	GITHIORO				**Domestic**	**Irrigation**			26.05		**B**
65	STEPHEN NDICHU KIBE	KARATINA				**Domestic**	**Irrigation**			25.73		**B**
66	DAVID MUCHIRI NGATA	KARENGE				**Domestic**	**Irrigation**			25.34		**B**
67	MBURU NJUGUNA	NYANDUMA				**Domestic**	**Irrigation**			27.71	9.1	**B**
68	MOSES NJUGUNA KIHANDA	KIAMBURURU				**Domestic**	**Irrigation**			28.35	63.7	**B**
69	KICHARO MUKORA KIGURU	NYANDUMA				**Domestic**	**Irrigation**			26	9.09	**B**
70	GICHARU NJOROGE KINAMA	KARATINA				**Domestic**	**Irrigation**			31.55	72.73	**C**
71	JUSTIN NDUNGU KIMANI	GATAMAIYU				**Domestic**				5.86	27.27	**B**
72	PETER KEIGI NDUGO	KOMOTHAI				**Domestic**				6.9	22.72	**B**
73	KABUE NYINGE	GATHUNGU				**.**						
74	GITHOTO/ MMWRA H.PRODUCER GROUP	GATAMAIYU	WRMA/AC/ 1732	3/1/2007	3/1/2008	**Domestic**				15.45		**B**
75	MBAKO WATER PROJECT	MBAUINI				**Domestic**	**Irrigation**			28	908.7	**C**
76	KIRUIRI S/H GROUP	GACHOIRE				**Domestic**	**Irrigation**			83	720	**C**
77	KIHATE IRRIGATION S/H GROUP	LARI										
78	JEFFERSON NGOTHO WAMBUI	KOMOTHAI										
79	KAGWE TEA FACTORY	GATAMAIYU										
80	GITRHUNGURI WATER & SANITATION LTD	.										
81	JAMES SAMUEL MBURU	KIAMBURURU						**Industry**		2	18	**B**

Resettlement Action Plan

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

ATHI WATER WORKS DEVELOPMENT AGENCY

ABBREVIATED RESETTLEMENT ACTION PLAN (RAP)

FOR

KINALE DAM WATER SUPPLY PROJECT

January 2021

Proponent: Athi Water Works Development Agency

TABLE OF CONTENTS

ABBREVIATIONS

A-RAP	Abbreviated Resettlement Action Plan
AWWDA	Athi Water Works Development Agency
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
GoK	Government of Kenya
HHs	Households
KFS	Kenya Forest Service
KWS	Kenya Wildlife Service
M&E	Monitoring and Evaluation
NEMA	National Environment Management Authority
NGAO	National Government Administration Officer
NLC	National Land Commission
PAPs	Project Affected People
RAP	Resettlement Action Plan
RLA	Registered Land Act
WRUA	Water Resource Users Association

GLOSSARY OF TERMS

Affected Person (AP): includes any person, affected households (AHs), firms or private institutions who, on account of changes that result from the project will have their (i) standard of living adversely affected; (ii) right, title, or interest in any house, land (including residential, commercial, agricultural, forest, and/or grazing land), water resources, or any other moveable or fixed assets acquired, possessed, restricted, or otherwise adversely affected, in full or in part, permanently or temporarily; and/or (iii) business, occupation, place of work or residence, or habitat adversely affected, with physical or economic displacement.

Assistance: means support, rehabilitation and restoration measures extended in cash and/or kind over and above the compensation for lost assets.

Compensation: means payment in cash or kind for an asset to be acquired or affected by a project at replacement cost or at current market value.

Cut-off date: means the date of starting the census and assets inventory of persons affected by the project. Persons occupying the project area after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the date of completion of the assets inventory, or an alternative mutually agreed on date, will not be compensated.

Displaced Person (DP): Displaced persons are those who are physically displaced (relocation, loss of residential land, or loss of shelter) and or economically displaced (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

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. The term also refers to those extending attached private land into public land or constructed structure on public land for only renting out.

Entitlement: means the range of measures comprising cash or kind compensation, relocation cost, income restoration assistance, transfer assistance, income substitution, and business restoration which are due to PAPs, depending on the type and degree /nature of their losses, to restore their social and economic base.

Household: A household includes all persons living and eating together (sharing the same kitchen and cooking food together as a single-family unit).

Inventory of losses: means the pre-appraisal inventory of assets as a record of affected or lost assets.

Relocation: means displacement or physical moving of the displaced persons from the affected area to a new area/site and rebuilding homes, infrastructure, provision of assets, including productive land/employment and re-establishing income, livelihoods, living and social systems

Replacement cost: means the value of assets to replace the loss at current market price, or its nearest equivalent, and is the amount of cash or kind needed to replace an asset in its existing condition, without deduction of transaction costs or for any material salvaged.

Resettlement: means mitigation of all the impacts associated with land acquisition including restriction of access to, or use of land, acquisition of assets, or impacts on income generation as a result of land acquisition.

Structures: mean all buildings including primary and secondary structures including houses and ancillary buildings, commercial enterprises, living quarters, community facilities and infrastructures, shops, businesses, fences, and walls, tube wells, latrines etc.

Vulnerable Households: means households that are (i) headed by single women or women with dependents and low incomes; (ii) headed by elderly/ disabled people without means of support; (iii) headed by minors.

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

PREAMBLE

This document presents the Resettlement Action Plan (RAP) for Kinale Dam Project (the Project). The Project will affect communities in the vicinity of the Project site, the Gatamaiyu River immediately downstream of the proposed dam. The RAP has been established in order to ensure that any economic or physical displacement resulting from the Project, whether permanent or temporary is undertaken in a socially responsible manner and according to good international practice. Through the RAP, the Project will apply the relevant national legislations of Kenya.

STRUCTURE OF THE RAP

The RAP has been developed and the overview of outline is described in Table 1 below

Table 1. Contents of the RAP

Chapter Outline	Executive Summary
One	Introduction
Two	Project Description
Three	International Policies and Requirements
Four	Legal and Institutional Context
Five	Project Impacts on Affected Communities
Six	Socio-Economic Baseline of Affected Communities
Seven	Valuation and Compensation
Eight	Grievance Mechanism
Nine	Consultations
Ten	Budget and Costs
Eleven	Implementation Arrangements

E 1. Project

The proposed project is in line with the Athi Water Works Development Agencies strategic plan of 2018 – 2022, the Vision 2030 and the Sustainable Development Goal (SDG) 6 which all have the objective of ensuring sustainable management of water and sanitation. The Government of Kenya (GoK) recognizes the importance water and sanitation plays in the performance of key sectors of the economy and the livelihoods of Kenyans. In the Vision 2030, the GoK underscores the importance of investing in water supply and sanitation services as a fundamental need for productive livelihoods.

E 2. Project Components

The proposed water supply projects involve construction of an earth fill dam, a water treatment plant capable of supplying 4,000 m^3/day of water per day and raw and treated water transmission lines. The proposed scope of works is as follows;

Kinale dam Height 22 m, Combined Net Yield of 4,000M^3/d;

a. Construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Side Spillway Channel), Diversion Tunnel, intake tower &, draw-off, tower access bridge.

b. Raw water mains 300mm internal diameter (Steel pipe), 3.6 km long through the forest area.

c. Conventional full treatment plant with a capacity of 4,000 m^3/day. This include the offices, operators' houses, and a storage tank

d. 30 km distribution lines d from the treatment plant and run along the Nakuru – Nairobi Highway. The off takes shall be made to feed the existing pipelines to Limuru town, Kimende, Kwambira, Ndeiya. There will be three balancing tanks for Limuru, Kimende, and Bibirioni.

E 3. Project Justification

About 90 percent of the county's water resource comprises of both surface water resources and ground water potential. The county is divided into several sub-catchments' areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi river sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two subcatchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares range. Last one is Ewaso

Kedong sub catchment which runs in the North-South direction and occupies the western part of the county. It has several streams that normally form swamps.

The Eastern part of the County that include Thika, Gatundu, Ruiru and Juja is well endowed with surface water where major rivers like Chania, Thika, Karimenu, Ruabura, Ndarugu, Thiririka, Theta, Mukuyu, Ruiru and many others traversing the area. The Feasibility Study and Master Plan for Developing New Water Sources for Nairobi and Satellite Towns has proposed various sites for dams which mostly provide gravity systems for both domestic and irrigation purposes. These can reduce electricity costs which is a major bottle neck in water service delivery due to high cost of pumping which further increases the cost of water provision. The pipe distribution network within the current surface area of the Water Service

Providers (WSPs) is fairly well done, however the major bottleneck especially for the rural WSPs is high non-revenue water (NRW). This is largely as a result of the customers connecting themselves illegally while others irrigate with water that is meant for domestic use which denies people on the downstream side access to water.

The Western part of the County covers Limuru, Kikuyu, Kiambu, Karuri, Lari and Githunguri areas which have limited surface sources except for Lari which has surface sources. Therefore, majority of the water systems here rely on boreholes as the main source of water supply. Some of the areas like Kiambu and its environs have ground water with high fluoride content. Due to inadequate ground water exploitation and high cost of operation and maintenance due to high electricity costs, the water coverage in the western part is very low with areas like Ndeiya having no supply although is the driest part of the County. It is important to construct proposed dams like Riara, Ruiru II, Tigoni, Kamiti and others which have been proposed to solve the problem in these areas. To ensure that the county benefits from the abundance of the water resources there is need for major investment in dam construction and distribution of pipe network.

The existing water schemes which are all pumping schemes have a total production capacity of 10,800 m^3/day. The present water demand is estimated at 35,000 m^3/day. Therefore, the existing water schemes are only able to meet 30% of the total water demand at the present. This gives a clear indication of the sad state of water supply and coverage in the project area.

According to the latest impact report, Issue No. 12/2020 Limuru Water and Sewerage Company which serves the two sub counties of Limuru and Lari has a serviceable population of 294,617 of which 146,927 people are served. This represents about 50% coverage. The production of Liwaseco is 1,678,000 m^3/year which translates to 4,600 m^3/day. This gap in coverage and adequacy necessitates the development of the new water sources.

E 4. Approach and Methodology

AWWDA will adopted a systematic, integrated, participatory and collaborative approach to achieve the objectives of the final RAP study. Document reviews and field investigations were conducted, in addition to consultations with administrators (Chiefs and their Assistants), community leaders and the affected communities.

The A-RAP examines all legal and regulatory frameworks and grievance redress procedures to be implemented for the identified areas that would require resettlement. The report also provides an implementation framework and accountability, monitoring and evaluation mechanisms.

The socio-economic profiles in the project area are yet to be conducted, however they will be provided in the final A-RAP.

E 5. Legal Framework of the A-RAP

This A-RAP and its entitlement matrix has been prepared in compliance with the applicable policy provisions of the Kenyan Government. Relevant Kenya laws considered include: -

- Land Act, 2012
- Valuers' Act
- The New Constitution of Kenya
- The Land Acquisition Act Chapter 295

Relevant resettlement policies requires that an A-RAP be prepared for all projects that anticipate resettlement issues and displacement affecting shelter, livelihood and associated impacts for less than 200 persons.

E 6. Census, Cut-off date and Socio-Economic study

The Households (HHs) census and the socio-economic baseline survey of the affected community/persons is yet to be finalized. The data will be presented in the final RAP.

Upon conclusion of the census activities the entitlement cut-off date will be established indicating when census began and the time when the assessment of persons and their property in the area was carried out.

E 7. Identification of Project Impacts

AWWDA undertook a scoping study from 21st to 25th September, 2020 designed to provide a preliminary view of the RAP status of the proposed project. The following was noted:

1. The proposed dam footprint is situated within the forest and necessary permits will be attained from Kenya Forest Service (KFS) to facilitate construction of the infrastructure. Asset Inventory of affected trees within the forest will be carried out by KFS and the register included in the final RAP;

2. There was evidence of Plantation Establishment and Livelihood Improvement Scheme (PELIS) system taking place. Kenya Forest Service (KFS) allows communities living adjacent to the forest, through community forest associations (CFOs) the right to cultivate agricultural crops during the early stages of forest plantation establishment. Some of these communities will be affected and will need notice to vacate the area once construction commences.
3. The reservoir area beyond the forest was settled with approximately 50No households carrying out farming activities with the exception of 1 No. house constructed within the identified area. This area was previously alienated as a conservation area.
4. The conservation areas adjacent to the forest are alienated and title deeds issued. Therefore there is need to degazette the area and conservation activities undertaken.
5. The proposed water treatment plant site and raw water transmission line are located within the forest therfore necessary permits and approvals are required from KFS.
6. The treated water transmission lines and supply lines will run along the road reserves. Necessary permits and approvals from the relevant agencies will be required.

The Asset Register: An Asset register detailing the assets likely to be affected and the likely damage is prepared as part of this A-RAP.

Figure 1: Scoping Exercise with area NGAO and Gatamaiyu River WRUA

E 8. Public Consultation and Participation

Key stakeholder engagements and consultations with the various stakeholders i.e. KFS, WRA, County Government of Kiambu, KWS were held.

The community/public consultations were conducted. Further, during the scoping exercise there was community consultations on a one-on one basis at their respective properties.

E 9. Valuation and Compensation Methodology

Valuation for assets involved field survey to collect data on the PAPs, land to be acquired/easement rights, structures, trees and crops affected.All affected persons irrespective of their status or whether they have formal titles, legal rights or not, will be eligible for some kind of assistance if they occupied the land before the entitlement cut-off date.

E 10. RAP Implementation

The RAP implementation will be undertaken before commencement of works. The implementation will be within one overall organizational set up, by multi-disciplinary teams on different levels. The RAP implementation anticipates that the following will be constituted:

- Constitution of the RAP implementation committee;
- A grievance resolution mechanism;
- A monitoring and evaluation mechanism.

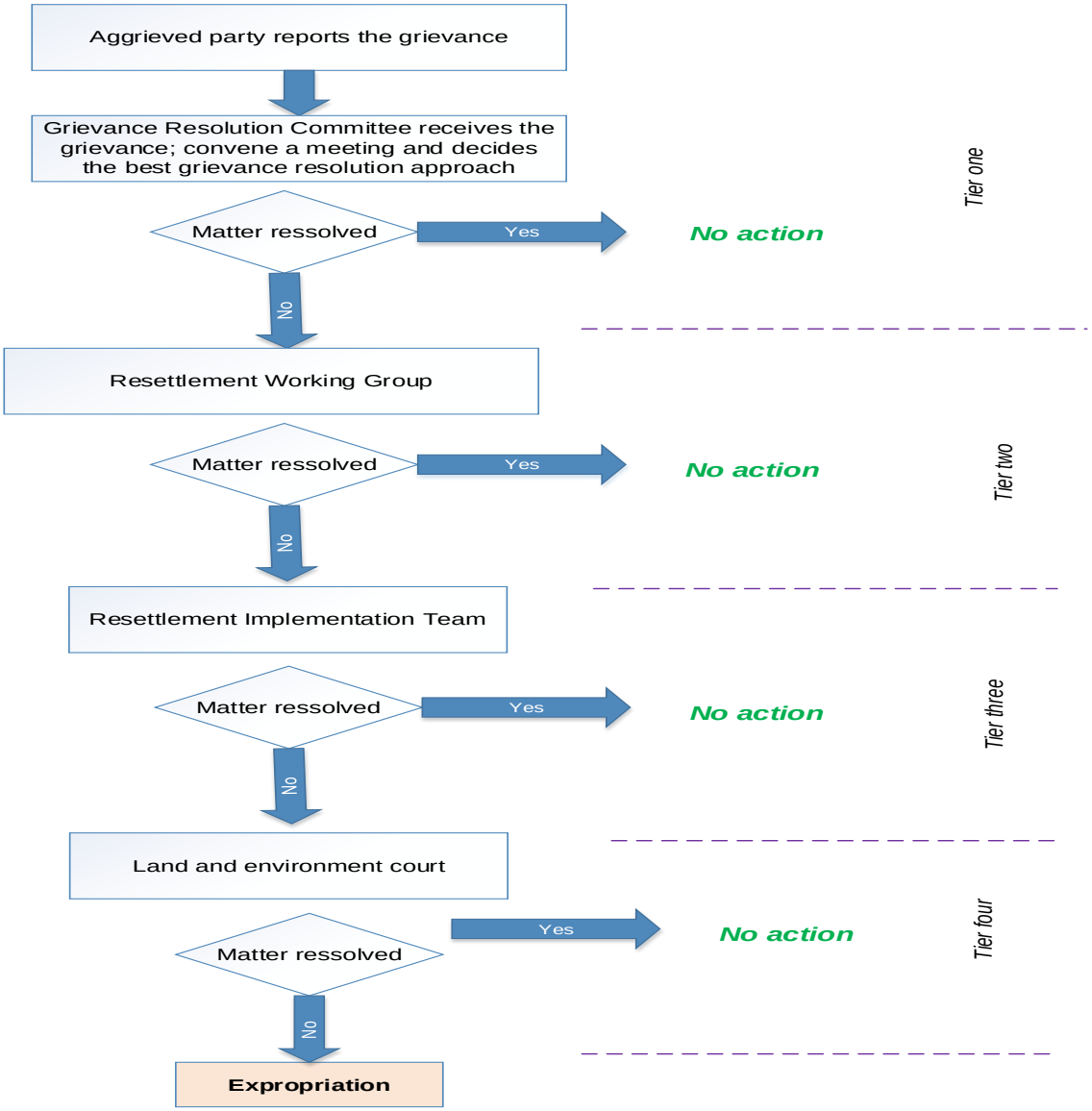
E 11. RAP implementation cost

The anticipated cost for the implementation of the RAP is **Kshs. 17,485,354.40**

E 12. Grievance Redress Mechanism

Grievance management forms a critical part of any resettlement program. In this project, grievance management will be handled by a redress committee which includes representatives of the community members and local administration and government institutions representatives.

The RAP also provides for a formalized grievance redress mechanism to help address any complaints and grievances of the PAPs and to enhance the acceptance of resettlement program through participation and support of the affected community. This RAP will use the grievance resolution mechanisms as shown in the flow chart below:



E 13. RAP Monitoring

In order to guarantee that the resettlement plan is smoothly performed and the interests of the affected persons are well taken care of, the implementation of the RAP will be under monitoring throughout the whole process. Monitoring will be divided into two parts, i.e. internal and external monitoring.

The internal monitoring will be performed by AWWDA. The target of internal monitoring is to ensure that there is overall fairness and transparency while compensation process takes place and the RAP is implemented based on legal rights. The main monitoring parameters would be the compensation allocation schedule, payment and use of the compensation fee and implementation of the policies and regulations specified in the RAP.

External monitoring will be conducted through a contracted independent and qualified consultant. The consultant will visit the project area at least quarterly. The consultant will ensure that:

- Monies paid to households who have lost crops and other forms of livelihood production have received fair compensation
- Where land has been permanently acquired for the project, households affected have been afforded fair compensation.
- The grievances raised by stakeholders, notably PAPs, have been settled within the stipulated timeframe without delays; including the effectiveness of the compensation delivery system.
- Review the results of internal monitoring and review overall compliance of the RAP

CHAPTER ONE: INTRODUCTION

1.1 Background of the Project

The Kenyan Constitution of 2010 recognizes water as a basic human right. The Constitution stipulates in its Part 4 – Rights and Fundamental Freedoms, Section 43 (1) of the Economic & Social Rights that "Every person has the right (to) clean and safe water in adequate quantities." It is in this light that the proposed Kinale Dam Water Supply project is being prioritized to have the provision of clean and affordable water supply to the residents of Lari and Limuru sub - counties.

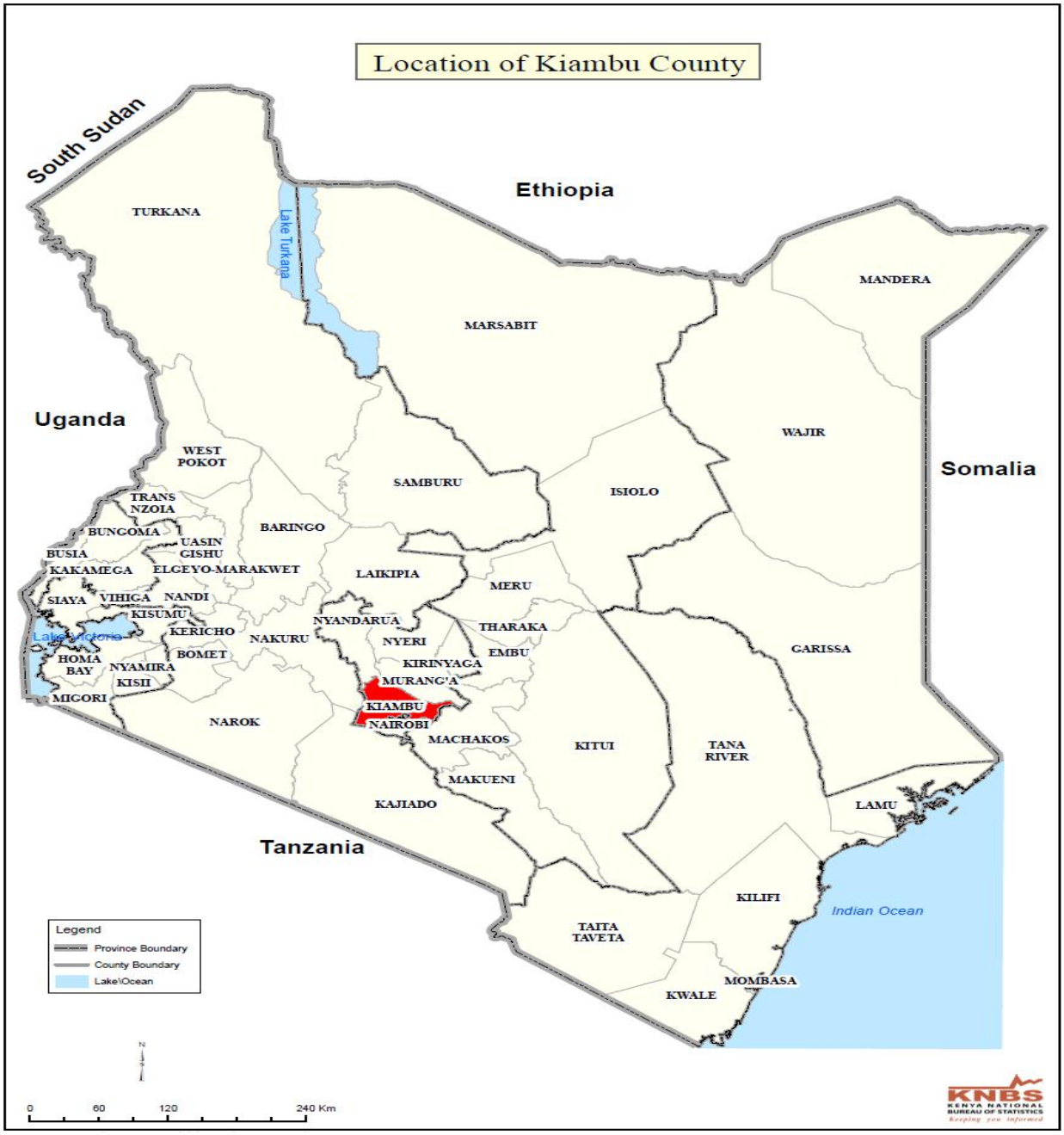
The proposed project is in line with the Athi Water Works Development Agency's strategic plan of 2018 – 2022, the Vision 2030 and the Sustainable Development Goal (SDG) 6 which all have the objective of ensuring sustainable management of water and sanitation. The Government of Kenya (GoK) recognizes the importance water and sanitation plays in the performance of key sectors of the economy and the livelihoods of Kenyans. In the Vision 2030, the GoK underscores the importance of investing in water supply and sanitation services (WSS) as a fundamental need for productive livelihoods.

The Government of Kenya (GoK) through Athi Water Works Development Agency (AWWDA) has initiated proposals for some water supply projects in Kiambu County. In particular, AWWDA has initiated the **Proposed Kinale Dam Water Supply Project** to serve approximately 50,000 people Lari and Limuru sub - counties.

The proposed water supply project involves construction of an earth fill dam with associated works; a water treatment plant capable of supplying 4,000 m^3/day of water per day and raw and treated water transmission lines.

1.2 Project location

Kiambu County is one of the 47 counties in the Republic of Kenya. It is located in the central region and covers a total area of 2,538.7 Km^2 with 476.3 Km^2 under forest cover according to the 2019 Kenya Population and Housing Census. Kiambu County borders Nairobi and Kajiado Counties to the South, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West as indicated in Map 1. The county lies between latitudes 00 25'and 10 20'South of the Equator and Longitude 360 31'and 370 15'East.



Map 1: Location of Kiambu County

The project targets to cover the Western part of Kiambu County specifically Lari and Limuru sub - counties in Kiambu County. The dam is situated in Kinale location within Kinale and Kereita forests.

1.3 Administrative Setting

Kiambu County is currently divided into twelve (12) sub-counties namely Limuru, Kikuyu, Lari, Gatundu South, Gatundu North, Githunguri, Kiambu, Ruiru, Thika, Juja, Kiambaa, and Kabete. These are further sub-divided into 29 divisions, 95 locations and 236 sub locations. The table below highlights the administrative units of the project site including the dam area, raw water mains, treatment plant, treated water transmission line and balancing storage tanks sites.

Administrative and Electoral Units

Kiambu County has twelve (12) constituencies, which are Gatundu South, Gatundu North, Juja, Thika Town, Ruiru, Githunguri, Kiambu, Kiambaa, Kikuyu, Kabete, Limuru, and Lari. These constituencies are further divided into 60 electoral wards. Ruiru Constituency has the highest number of wards with 8 wards, while the rest of the constituencies have five each with the exemption of Kiambu, Gatundu South and Gatundu North which have four each.

Table 2. Affected Counties and Sub Counties

County	Sub-Counties
Kiambu	Lari
	Limuru

1.3.1 Demographic Data

According to the 2019 Kenya Population and Housing Census, Kiambu County had a total population of 2,417,735 and 795,241 households. The average size of each household for the county was estimated at 3.0. The County's population for 2019 per sex distribution included some 1,187,146 males and 1,230,454 females while 135 were reported to be intersex. According to the 2019 population census, the population distribution for the wider project target area which include Lari and Limuru sub counties is presented in the following table:

Table 3. Population of the Project Target Area

Areas	Male	Female	Intersex	Total Population	No. of Households	Average Household Size	Population Density (Per sq.km
Lari	67,061	68,238	4	135,303	38,592	3.5	313
Limuru	79,632	79,682	-	159,314	49,174	3.2	559
Total	**146,693**	**147,920**	**4**	**294,617**	**87,766**	**6.7**	**872**

Source: 2019 Population Census

1.5 Scope of the A-RAP

The project scope of the A-RAP study include:

- Identification of Project Affected Persons (PAPs);
- Identification land parcels to be attained for development of project infrastructure;
- Collection of qualitative and quantitative baseline socio-economic data of PAPs;
- Establishment of entitlements to PAPs;
- Collection of preferences for compensation;
- Development of the ARAP.

1.6 Justification for Abbreviated Resettlement Action Plan

The scope and level of detail of resettlement planning varies with circumstances, depending on the project's complexity and the magnitude of its effects. This project is envisaged to have minimal impact on the PAPs. This is because approximately 80No PAPs will be affected. The PAPs are practising agricultural activities within the identified areas for the construction of the dam. 3 Month's notices will be issued for the PAPs to cease from continuing to cultivate in the identified area and clear their assets especially for the seasonal crops.

No physical relocation will be done expect for 1No PAP who has constructed a house within the proposed dam area.

Figure 2. Encroached household residing within the identified dam area.

This calls for the preparation of individual Resettlement Plan that must be consistent with the relevant Kenyan resettlement policies and regulations.

1.7 Project justification

About 90 percent of the county's water resource comprises of both surface water resources and ground water potential. The county is divided into several sub-catchments' areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi river sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two sub catchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares range. Last one is Ewaso Kedong sub catchment which runs in the North-South direction and occupies the western part of the county. It has several streams that normally form swamps.

The Eastern part of the County that include Thika, Gatundu, Ruiru and Juja is well endowed with surface water where major rivers like Chania, Thika, Karimenu, Ruabura, Ndarugu, Thiririka, Theta, Mukuyu, Ruiru and many others traversing the area. The Feasibility Study and Master Plan for Developing New Water Sources for Nairobi and Satellite Towns has proposed various sites for dams which mostly provide gravity systems for both domestic and irrigation purposes. These can reduce electricity costs which is a major bottle neck in water service delivery due to high cost of pumping which further increases the cost of water provision. The pipe distribution network within the current surface area of the Water Service Providers (WSPs) is fairly well done, however the major bottleneck especially for the rural WSPs is high non-revenue water (NRW). This is largely as a result of the customers connecting themselves illegally while others irrigate with water that is meant for domestic use which denies people on the downstream side access to water.

The Western part of the County covers Limuru, Kikuyu, Kiambu, Karuri, Lari and Githunguri areas which have limited surface sources except for Lari which has surface sources. Therefore, majority of the water systems here rely on boreholes as the main source of water supply. Some of the areas like Kiambu and its environs have ground water with high fluoride content. Due to inadequate ground water exploitation and high cost of operation and maintenance due to high electricity costs, the water coverage in the western part is very low with areas like Ndeiya having no supply although is the driest part of the County. It is important to construct proposed dams like Riara, Ruiru II, Tigoni, Kamiti and others which have been proposed to solve the problem in these areas. To ensure that the county benefits from the abundance of the water resources there is need for major investment in dam construction and distribution of pipe network.

The existing water schemes which are all pumping schemes have a total production capacity 10,800 m^3/day. The present water demand is estimated at 35,000 m^3/day. Therefore, the existing water schemes are only able to meet 30% of the total water demand at the present. This gives a clear indication of the sad state of water supply and coverage in the project area.

According to the latest impact report, Issue No. 12/2020 Limuru Water and Sewerage Company which serves the two sub counties of Limuru and Lari has a serviceable population of 294,617 of which 146,927 people are served. This represents about 50% coverage. The production of Liwaseco is 1,678,000 m^3/year which translates to 4,600 m^3/day. This gap in coverage and adequacy necessitates the development of the new water sources.

Table 4. Overall Water Demand Requirements

Summary				
Year	**Present year 2020**	**Initial year 2023**	**Future year 2033**	**Ultimate year 2043**
Limuru Water Demand (m3/day)	21,636.67	22,510.79	27,440.53	33,449.86
Water Demand for 5 dry Months	3,245,500.5 m^3	3,376,618.5 m^3	4,116,079.5 m^3	5,017,479 m^3

Source: 'Kinale Dam Water Project: Project Feasibility Report – Athi Water Works Development Agency

CHAPTER TWO: PROJECT DESCRIPTION

2.1. Overview

The project is located in Kiambu County within Kinale and Kereita forest and is part of AWWDA strategy to address the water needs of the communities living in to Limuru town, Kimende, Kwambira and Ndeiya.

Figure 3. Section of proposed dam site within the forest

2.2. Kinale Dam Water Supply

The proposed water supply projects involve construction of a dam to supply water to the project areas, a water treatment plant capable of supplying 4,000 m^3/day of water per day, raw and treated water pipelines. The proposed scope of works is as follows;

Kinale dam Height 22 m, Combined Net Yield of 4,000M^3/d;

e. Construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Side Spillway Channel), Diversion Tunnel, intake tower &, draw-off, tower access bridge.
f. Raw water mains 300mm internal diameter (Steel pipe), 3.6 km long through the forest area.
g. Conventional full treatment plant with a capacity of 4,000 m^3/day. This include the offices, operators' houses, and a storage tank
h. 30 km distribution lines d from the treatment plant and run along the Nakuru – Nairobi Highway. The off takes shall be made to feed the existing pipelines to Limuru town, Kimende, Kwambira, Ndeiya. There will be three balancing tanks for Limuru, Kimende, and Bibirioni.

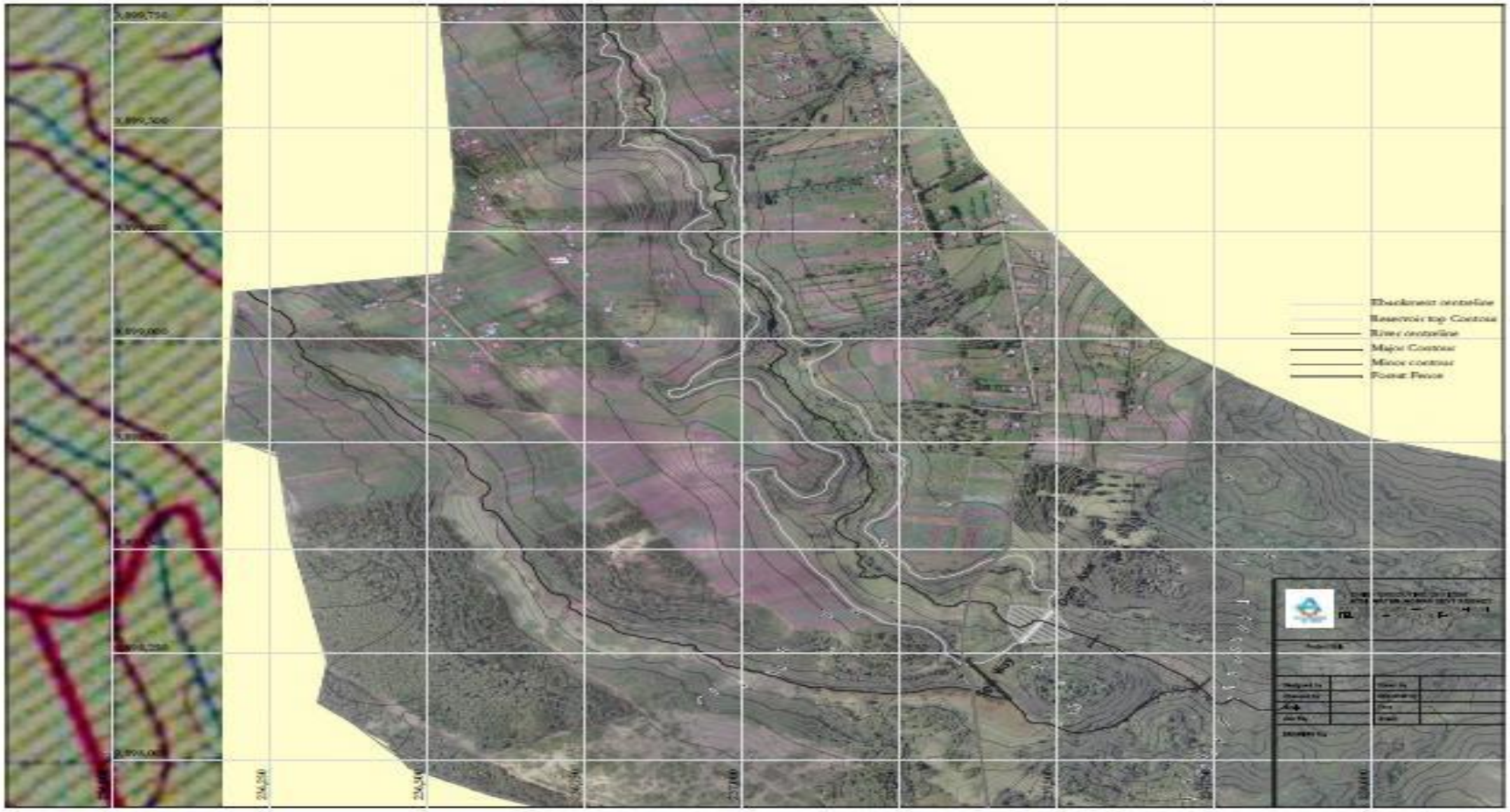


Figure 4. Proposed Kinale Dam Water Project

2.3 Project Cost

The total cost of the project is estimated at Kshs 956 million. The table below provides a summary of the Project costs by component. These costs are derived from the Project Feasibility Study Report.

Table 5. Estimated Project Cost

PROPOSED KINALE DAM WATER SUPPLY PROJECT				
ITEM NO.	DESCRIPTION	RATE (Kshs.)	AMOUNT (Kshs.)	
	WATER SUPPLY			
1	Kinale Dam		551,000,000.00	
2	Treatment Works		265,000,000.00	
3	Storage Tanks		34,000,000.00	
4	Raw Water Main		40,000,000.00	
5	Distribution Mains (30 Kms)		150,000,000.00	
	SUB- TOTAL 1		1,040,000,000.00	
	ADD 10% FOR ENGINEERING COSTS & PRELIMINARIES		104,000,000.00	
	SUB- TOTAL 2		1,144,000,000.00	
	ADD 15% CONTINGENCY		171,600,000.00	
	SUB TOTAL 3		1,315,600,000.00	
	ADD 14% VAT		184,184,000.00	
	GRAND TOTAL		1,499,784,000.00	

2.4 The Proponent

Athi Water Works Development Agency (AWWDA) is one of the eight WWDAs established under the Water Act, 2016 to take charge of the Nairobi City, Kiambu and Murang'a Counties. The Agency is mandated to;

(i) Undertake the development, maintenance and management of the national public water works within its area of jurisdiction;
(ii) Operate the waterworks and provide water services as a water service provider, until such a time as responsibility for the operation and management of the waterworks are handed over to a county government, joint committee, authority of county governments or water services provider within whose area of jurisdiction or supply the waterworks is located;
(iii) Provide reserve capacity for purposes of providing water services where, the Regulatory Board orders the transfer of water services functions from a defaulting water services provider to another licensee;
(iv) Provide technical services and capacity building to such county governments and water services providers within its area as may be requested; and
(v) Provide to the Cabinet Secretary technical support in the discharge of his or her functions under the Constitution and the Water Act, 2016.

2.5. Components necessitating resettlement

The proposed project will lead to minimal land take majorly for the proposed dam site. The dam footprint will be located within the forest area however, the reservoir stretches outside the forest to the settlement area. The treatment plant is within the forest while the proposed treated water transmission lines will be laid along road reserves. The breakdown is shown below in Table 5:

Table 6. Summary of RAP requirement for the Infrastructures under the project

Kinale Dam water supply project	
Project Component	**Land Ownership**
Dam	
Footprint	KFS – Kereita & Kinale forest (Public land)
Reservoir	Forest area & Settlement area (Area was previously demarcated as a conservation area. However, titles have been issued and the land is allocated.) De - Gazettement of allocated area needs to be done.
Water Treatment Plant	KFS – Forest Area (Public land)
Transmission line	

Kinale Dam water supply project	
Project Component	**Land Ownership**
Raw Water	KFS – Forest Area (Public land)
Treated Water	Road Reserves (Public land)

2.6 Approach and methodology

The approach for preparation of the A-RAP was through scoping acticivites of the proposed dam, treatment plant site and the associated transmission lines.

Given the sensitive nature of implementation of resettlement action plan activities, AWWDA sought the help of the area national government administration officers during the scoping exercise.

AWWDA will further carried out a detailed social assessment of the proposed sites after the project affected persons were identified. The team will used both qualitative and quantitative techniques to collect data and information on the social and economic status of the communities within the proposed area. These included:

- A detailed desk study to establish and describe the socio-economic conditions;
- Key Informant Interviews and Semi-Structured Interviews with the Chiefs, Assistant Chiefs, opinion leaders and Village Elders;
- Open-ended questionnaires to obtain views about the proposed project and its perceived impacts from households;
- Public Barazas organised and chaired by the Chiefs and Assistant Chiefs;
- Transect walk, to establish the biophysical nature of the project area and to meet the stakeholders;
- A check list of the information to collect from each category of the persons to be interviewed to guide the collection of data throughout the field exercise; and,
- Photography- cameras to take photographs of public participation meetings, PAPs and affected assets (trees, crops, houses etc.).

The data was analysed both manually and electronically.

CHAPTER THREE: LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter looks at the various legislations that relate to land acquisition and resettlement in Kenya. This A-RAP will apply the laws, legislation, regulations, and local rules governing the use of land and other assets in Kenya

Kenya's relevant legal and institutional framework is presented in four sections:

I. Laws on Property and land rights, as defined by Kenyan law and customary practice;
II. Expropriation/acquisition of land and compensation of land and other assets,
III. Grievance Resolution Mechanism, specifically the legal and institutional arrangements for filing grievances or complaints and how those grievances are addressed through formal and informal systems of dispute resolution.

3.1. Laws of Kenya

3.1.1. Overview

The **Constitution of Kenya, 2010** currently in force, replaced the 1969 constitution. The new Kenya Constitution has a comprehensive Bill of Rights in **Chapter Four (4)** and a well elaborated **Chapter Five (5)** on Land and Environment. These two chapters provide constitutional basis for land ownership, expropriation and protection of rights to land. Land in Kenya is classified as public, community or private. Prior to the new Constitution, there were over 70 pieces of legislations, Acts and subsidiary law governing land and land matters. Under the new Constitution they are being consolidated and rationalised to four pieces of legislation as follows: -

- National Land Act, – discusses Land issues in general and establishes mechanisms for Land acquisition;
- Land and Environmental Court – this establishes a court to deal with all disputes;
- Land Registration Act; and
- The Community Land Act.

Article 60 (1) states that "*Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance to the following principles:*

- Equitable access to land;
- Security of land rights;
- Sustainable and productive management of land resources;
- Transparent and cost effective administration of land;
- Sound conservation and protection of ecological sensitive areas;

- Elimination of gender discrimination in law, customs and practices related to land and property in land; and
- Encouragement of communities to settle land disputes through the recognized local community initiatives consistent with this Constitution.

The State is permitted to regulate the use of any land, or any interest in or right over any land in the interest of defence, public safety, public order, public morality, public health, or land use planning.

According to **Article 61 (1),** all land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals.

Land is classified as public land, community land or private land and each category is defined in the subsequent articles. Public land is defined to include all minerals and mineral oils; government forests, government game reserves, water catchment areas, national parks, government animal sanctuaries and specially protected areas, gazetted roads and thoroughfares, all rivers, lakes and other water bodies as defined by law; the territorial sea, continental shelf, exclusive economic zone and the sea bed, all land between the high and low water marks, any land not classified as community or private land under the Constitution-such public land shall vest and be held in trust by the national government in trust for the people of Kenya and shall be administered by the National Land Commission.

Community land includes land that is "*lawfully held, managed or used by specific communities as community forest, grazing areas or shrines*," and *"ancestral lands and lands traditionally occupied by hunter-gatherer communities."* Rights are also held through traditional African systems, and rights that derive from the English system introduced and maintained through laws enacted by colonial and then the national parliament. The former is loosely known as customary tenure bound through traditional rules (customary law). The latter body of law is referred to as statutory tenure, secured and expressed through national law, in various Act of parliament e.g. **Land Act 2012, Land Registration Act, 2012, Trust Land Act (cap 288)** of the Laws of Kenya.

The right to property is protected in **Article 40 (1)** Subject to Article 65; "*every person has the right, either individually or in association with others, to acquire and own property of any description; and in any part of Kenya".*

The following land tenure systems exist in Kenya:

Customary Land Tenure

This refers to unwritten land ownership practices by certain communities under customary law. Kenya being a diverse country in terms of its ethnic composition has multiple customary tenure systems, which vary mainly due to different agricultural practices, climatic conditions and cultural practices. However most customary tenure systems exhibit a number of similar characteristics as follows: First, individuals

or groups by virtue of their membership in some social unit of production or political community have guaranteed rights of access to land and other natural resources. Individuals or families thus claim property rights by virtue of their affiliation to the group.

Freehold Tenure

This tenure confers the greatest interest in land called absolute right of ownership or possession of land for an indefinite period of time, or in perpetuity. Freehold land is governed by the **Land Registration Act, 2012**. The Act provides that the registration of a person as the proprietor of the land vests in that person the absolute ownership of that land together with all rights, privileges relating thereto. A freehold title generally has no restriction as to the use and occupation but in practice there are conditional freeholds, which restrict the use for say agricultural or ranching purposes only. Land individualization was demanded by the colonial settlers who required legal guarantee for the private ownership of land without which they were reluctant to invest.

Leasehold Tenure

Leasehold is an interest in land for a definite term of years and is granted by a freeholder usually subject to the payment of a fee or rent and is subject also to certain conditions which must be observed e.g. relating to developments and usage. Leases are also granted by the government for government land, the local authorities for trust land and by individuals or organizations owning freehold land. The maximum term of government leases granted in Kenya is 99 years for agricultural land and urban plots. There are few cases of 33 years leases granted by government in respect of urban trust lands. The local authorities have granted leases for 50 and 30 years as appropriate.

Public Tenure

This is where land owned by the Government for its own purpose and which includes unutilized or un-alienated government land reserved for future use by the Government itself or available to the general public for various uses. The land is administered under the **Land Act 2012**. These lands were vested in the president and who has, normally exercised this power through the Commissioner of Lands, to allocate or make grants of any estates, interests or rights in or over un-alienated government land. However the new constitution grants those rights to the **National Land Commission (NLC)** which is governed by the National Land Commission Act, 2012 that specifies the role of NLC.

The **Land Act 2012**, Part III, Section 27 recognizes the capacity of a child as being capable of holding title to land. However, this can only happen through a trustee and such a child shall be in the same position as an adult with regard to child's liability and obligation to the land.

3.2.3 The Constitution of Kenya, 2010

GoK protects the sanctity of private property rights and affirms that the Government cannot compulsorily acquire any property except in accordance with law. Article 40(3) states:

"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 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 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.

The Constitution empowers the state to exercise the authority of compulsory acquisition. **Land Act 2012** (LA) designates the **National Land Commission (NLC)** as the agency empowered to compulsorily acquire land. Article 40 of the Constitution provides that the state may deprive owners of property only if the deprivation is *"for a public purpose or in the public interest*," which includes public buildings, roads, wayleaves, drainage, irrigation canals among others. The state's exercise of this power is left at the discretion of National Land Commission, and requires the state to make full and prompt payment of *"just compensation*" and an opportunity for appeal to court.

Article 40 (3) (a) refers to acquisition and conversion of all kinds of land in Kenya (private, public, community land and foreign interests in land). The Constitution further provides that payment of compensation shall be made to "*occupants in good faith*" of land acquired by the state who do not hold title for such land [Article 40 (4)]. An occupant in good faith is a "*bona fide"* occupant. On the other hand, under the Constitution, those who have acquired land illegally are not regarded as deserving any compensation [Article 40 (6)].

3.2.4 The Land Act, 2012

The Land Act is the Kenya's framework legislation regulating compulsory acquisition of land (i.e. land, houses, easements etc.). The Land Act was adopted on 2nd May 2012 and provides for sustainable administration and management of land and land based resources including compulsory acquisition.

Section 107 (1) provides for the power of entry to inspect land**. Sub-section (1)** states that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110, the respective Cabinet Secretary or the County Executive Committee Member shall submit a request for acquisition of public land to the Commission to acquire the land on its behalf. **Sub-section (2)** requires that the Commission prescribe a criteria and guidelines to be adhered to by the acquiring authorities in the acquisition of land.

Sub-section(5) stipulates that upon approval of a request under sub-section (1), the Commission shall publish a notice to that effect in the Gazette and the county Gazette, and shall deliver a copy of the notice to the Registrar and every person who appears to the Commission to be interested in the land.

Sub-section (8) states that all land to be compulsorily acquired shall be geo-referenced and authenticated by the office or authority responsible for survey at both the national and county government

Under **Section 108 (1)** The Commission may authorize, in writing, any person, to enter upon any land specified in a notice published under section 107 and inspect the land and to do all things that may be reasonably necessary to ascertain whether the land is suitable for the intended purpose.

Section 109 provides payment for damage for inspection. As soon as practicable after entry has been made under section 108, the Commission shall promptly pay in full, just compensation for any damage resulting from the entry.

Section 110 (1) stipulates that land may be acquired compulsorily under this Part if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.

Section 111 (1) states that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. Under Subsection (2), The Commission shall make rules to regulate the assessment of just compensation.

Section 112 (1) requires that at least thirty days after publishing the notice of intention to acquire land, the Commission shall appoint a date for an inquiry to hear issues of propriety and claims for compensation by persons interested in the land, and shall

(a) Cause notice of the inquiry to be published in the Gazette or county Gazette at least fifteen days before the inquiry; and

(b) Serve a copy of the notice on every person who appears to the Commission to be interested or who claims to be interested in the land.

Section 113 (1) requires that upon the conclusion of the inquiry, the Commission shall prepare a written award, in which the Commission shall make a separate award of compensation for every person whom the Commission has determined to have an interest in the land. Every award shall be filed in the office of the Commission (Subsection 4).

Part III of the Land Act 2012, section 113 (2a) states that "*the Commission shall determine the value of land with conclusive evidence of (i) the size of land to be acquired; (ii) the value, in the opinion of the Commission, of the land; (iii) the amount of compensation payable, whether the owners of land have or have not appeared at the inquiry.*"

Market value of the property, which is determined at the date of the publication of the acquisition notice must be taken into account when determining compensation. Determination of the value has to take into consideration the conditions of the title and the regulations that classify the land use e.g. agricultural, residential, commercial or industrial. Increased market value is disregarded when:

- It is accrued by improvements made within two years before the date of the publication of the acquisition notice, unless it is proved that such improvement was made in good faith and not in contemplation of the proceedings for compulsory acquisition. It is accrued by land use contrary to the law or detrimental to the health of the occupiers of the premises or public health.
- Any damages sustained or likely to be sustained by reason of severing such land from other land owned by the claimant.
- Any damage sustained or likely to be sustained if the acquisition of the land had negative effects on other property owned by the claimant.
- Reasonable expenses, if as a consequence of the acquisition, the claimant was compelled to change his residence or place of business (i.e., compensation for disruption to the claimant's life).
- Any damage from loss of profits over the land occurring between the date of the publication of the acquisition notice and the date the NLC takes possession of the land.

Section 114 (2) stipulates that upon acquisition of land, and prior to taking possession of the land, the Commission may agree with the person who owned that land that instead of receiving an award, the person shall receive a grant of land, not exceeding in value the amount of compensation which the Commission considers would have been awarded, and upon the conclusion of the agreement that person shall be deemed to have conclusively been awarded and to have received all the compensation to which that person is entitled in respect of the interest in that land.

Section 115 stipulates that upon the conclusion of the inquiry, and once the NLC has determined the amount of compensation, NLC will prepare and serve a written award of compensation to each legitimate claimant. NLC will publish these awards which will be considered "final and conclusive evidence" of the area of the land to be acquired, the value of the land and the amount payable as compensation. Land Act, Section 115 further stipulates that an award shall not be invalidated by reason only of a discrepancy between the area specified in the award and the actual area of the land. Compensation cannot include attorney's fees, costs of obtaining advice, and costs incurred in preparing and submitting written claims.

A notice of award and offer of compensation shall be served to each person by the Commission. **Section 120** provides that "*first offer compensation shall be paid promptly*" to all persons interested in land. Section 119 provides a different condition and states that the NLC "as soon as practicable" will pay such

compensation. Where such amount is not paid on or before the taking of the land, the NLC must pay interest on the awarded amount at the market rate yearly, calculated from the date the State takes possession until the date of the payment.

In cases of dispute, the Commission may at any time pay the amount of the compensation into a special compensation account held by the Commission, notifying the owner of the land accordingly. If the amount of any compensation awarded is not paid, the Commission shall on or before the taking of possession of the land, open a special account into which the Commission shall pay interest on the amount awarded at the rate prevailing bank rates from the time of taking possession until the time of payment.

Once the first offer payment has been awarded, the NLC will serve notice to landowners on the property indicating the date the Government will take possession. Upon taking possession of land, the commission shall ensure payment of just compensation in full. When this has been done, NLC removes the ownership of private land from the register of private ownership and the land is vested in the national or county Government as public land free from any encumbrances (Section 115 & 116).

On the other side, the Commission also has the power to obtain temporary occupation of land. However, the commission shall as soon as is practicable, before taking possession, pay full and just compensation to all persons interested in the land.

In cases of where there is an urgent necessity for the acquisition of land, and it would be contrary to the public interest for the acquisition to be delayed by following the normal procedures of compulsory acquisition under this Act, the Commission may take possession of uncultivated or pasture or arable land upon the expiration of fifteen days from the date of publication of the notice of intention to acquire. On the expiration of that time NLC shall, notwithstanding that no award has been made, take possession of that land. If the documents evidencing title to the land acquired have not been previously delivered, the Commission shall, in writing, require the person having possession of the documents of title to deliver them to the Registrar, and thereupon that person shall forthwith deliver the documents to the Registrar. On receipt of the documents of title, the Registrar shall — cancel the title documents if the whole of the land comprised in the documents has been acquired; if only part of the land comprised in the documents has been acquired, the Registrar shall register the resultant parcels and cause to be issued, to the parties, title documents in respect of the resultant parcels. If the documents are not forthcoming, the Registrar will cause an entry to be made in the register recording the acquisition of the land under this Act.

Part IX of the Land Act provides for settlement programs. Under **Section 134 (1),** The Commission shall, on behalf of the national and county governments, implement settlement programmes to provide access to land for shelter and livelihood.

Subsection (2) stipulates that settlement programmes shall, include, but not be limited to provision of access to land to squatters, persons displaced by natural causes, development projects, conservation, internal conflicts or other such causes that may lead to movement and displacement.

3.2.5. Land Laws (Amendment) Act, 2016

Section 44(b) (2) (b) of this act states that:

(2) The Commission shall establish and maintain a register containing-……...

(b) the names and addresses of all persons whose land has converted to public through compulsory acquisition or reversion of leasehold……

These provisions once enacted will be critical in management of public land acquired for establishment of infrastructure as they would provide a record of publicly acquired land.

3.2.6. Valuers' Act, Chapter 532

Under The Valuers' Act, Chapter 532, Compensation awards will be made by the National Land Commission based on land valuation determined by registered Valuers. Besides, the Valuers Act establishes the Valuers Registration Board, which regulates the activities and practice of registered Valuers. All Valuers must be registered with the Board to practice in Kenya. The Board shall keep and maintain the names of registered Valuers which shall include the date of entry in the register, the address of the person registered the qualification of the person and any other relevant particular that the Board may find necessary.

Relevance
Valuation of the affected assets was done by a registered valuer. This Act regulates the activities and practice of all registered Valuers.

3.2.7. Physical Planning Act

The Physical Planning Act deals with matters relating to preparation of all land use plans, physical development plans and subdivisions. The powers of expropriation of land are vested in the Minister for Lands while the planning and surveys are vested in the Director of Lands and the Surveyor General respectively. The introduction of a devolved system of Government gives the function of county planning to the County while "General principles of land planning and the coordination of planning by counties" remains a national function.

3.2.8. The Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act, 2012

An Act of Parliament to make provision for the prevention, protection and provision of assistance to internally displaced persons and affected communities and give effect to the Great Lakes Protocol on the Protection and Assistance to Internally Displaced Persons, and the United Nations Guiding Principles on Internal Displacement and for connected purpose.

Section 3 of the Act state that 'displacement and relocation due to development projects shall only be lawful if justified by compelling and overriding public interests and in accordance with the conditions and procedures in Article 5 of the Protocol, Principles 7-9 of the Guiding Principles and as specified in sections 21-22 of this Act.

Displacement and relocation which come about due to development projects or projects to preserve the environment should be:

- Authorized and carried out in accordance with the applicable law;
- Justified by compelling and overriding public interests in the particular case; and
- Conducted when no feasible alternatives exist.

Relevance

This Act will provide direction should the project in the any unlikely event begin to consider expropriation. The Act protect PAPs against displacement and relocation which come about due to development projects.

3.2.9. The Land and Environment Court Act 2011

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.

Relevance:
The grievance mechanism developed in this RAP has the Land and Environment Court as a last resort dispute resolution institution. In case of any disputes relating to compensation if not resolved at the project level can be forwarded to the Land and Environment Court.

3.2.10. The National Land Commissions Act 2012

This is an Act of Parliament to make further provision as to 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.

Compulsory Acquisition in Kenya is also to be handled by the National Lands Commission.

Other mandates of the Commission include management of public land on behalf of the national and county governments.

The Act also mandates the Commission to ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations.

Thirdly, the Act empowers the Commission to administer all unregistered trust land and unregistered community land on behalf of the county government.

Relevance
This Act will be triggered since it gives mandate the national lands commission to acquire land on behalf of the government of Kenya or its agencies for construction of public projects.

Table 7. Summary of Kenyan Policies on Resettlement and Compensation

Category of PAPs/ Type of Lost Assets	Kenyan Law
Land Owners (loss of land)	The Land Act 2012 provides that written and unwritten official or customary land rights are recognized as valid land right. The

Category of PAPs/ Type of Lost Assets	Kenyan Law
	Law provides that people eligible for compensation are those holding land tenure rights Land Act 2012 provides for census through NLC inspection and valuation process Fair and just compensation which could be in form of cash compensation or Land for Land.
Land Squatters (i.e. those who have no recognizable legal right or claim to the land that they are occupying)	The constitution recognizes 'occupants of land even if they do not have titles' and payment made in good faith to those occupants of land. However, this does not include those who illegally acquired land
Land Users/ Land Sharecroppers	The Land Act is not clear on Land Users although in some cases they can receive some form of compensation depending on the determination by NLC
Owners of non-permanent buildings	The constitution of Kenyan respects the right to private property and in case of compulsory acquisition, just compensation must be granted to the owner for the loss temporary buildings.
Owners of permanent buildings	The constitution of Kenyan respects the right to private property and in case of compulsory acquisition, just compensation must be granted to the owner for the permanent building
Perennial and annual Crops	Cash compensation for the loss of crops
Seasonal crops	Cash compensation for the loss of crops
Livelihood restoration and development assistance	Not specific on livelihood. The constitution says some pay maybe made in good faith
Timing of compensation payments	The Land Act provides for prompt, just compensation before the acquisition of land.
Consultation and disclosure	The Land Act outlines procedures for consultation with affected population by the NLC and grievance management procedures.

Category of PAPs/ Type of Lost Assets	Kenyan Law
Relocation assistance and resettlement assistance	The Land Act does not out rightly stipulate assistance for relocation
Grievance mechanism and dispute resolution	Land Act 2012 clearly outlines the steps and process for grievance redress that includes alternative dispute resolution, re-negotiation with NLC and is backed by the judicial system through the Environmental and Land Court

CHAPTER FOUR: SOCIO-ECONOMIC INFORMATION AND RESETTLEMENT IMPACTS

The following section will provide a summary of methodology and results used to characterize socio-economic baseline conditions in the project area prior to significant project investment. Data used to establish the socio-economic baseline conditions will be derived from field surveys conducted in the project area and submitted in the final RAP. There are two broad data objectives for the socio-economic baseline assessment:

1. Establish a robust characterization of general pre-project socio-economic conditions against which future changes can be measured, and
2. Enable the following key issues to be addressed during project implementation:

- Issue No. 1: Physical or economic displacement of PAPs from the proposed dam plant site; raw water mains, treatment plant, treated water transmission line and balancing storage tanks site
- Issue No. 2: Loss of areas/fields used for cultivation due to exclusion from accessing the affected areas.
- Issue No. 3: Effects from an influx of migrants to the area, anticipated as a public response to perceived economic opportunity, leading to a number of issues including the following:
    a) Inflation and resulting social tension due to economic disparities
    b) Increased social pathologies such as crime and prostitution
    c) Decreased access to existing services and infrastructure
- Issue No. 4: Increased risk of STDs including HIV/AIDS as a result of increased movement through the project area, especially from truck traffic during the construction.
- Issue No. 5: Economic marginalization of resident population if skilled labor and professional positions are assigned to a better-educated group of non-residents.

The fieldwork will be carried out by a team of social scientists. The survey team will employ the following methods:

- Quantitative household survey
- Participatory Rural Appraisal (PRA)
- Focus Group Discussions
- Key-Informant Interviews

Applying this suite of methods assures that several distinct perspectives are offered on the socio-economic conditions in the Project area and that a mix of both qualitative and quantitative results is produced. Households will be identified and a random sub-sample will be chosen for in-depth interview.

4.1 Approach for Identifying Project Affected Persons and Resettlement Impacts

Identification of project's affected persons and the resettlement impacts was carried out in conjunction with the area national government administration office and the village elders. The following categories of PAPs were used in identifying groups of PAPs for the purpose of determining impacts:

Project affected persons (PAPs) are individuals whose assets are lost, including land, property, developments, other assets, and/or access to natural and/or who lose access to economic resources as a result of activities related to the project, whether permanently or temporarily.

Project affected households are groups of PAPs in one household and where one or more of its members are directly affected by the Project. These include members like the head of household, male, and female members, dependent relatives, tenants, etc.

Vulnerable groups of people. From these households, the Project will separately identify the vulnerable members, such as those who are old or ill; children; those with HIV/AIDS; women; unemployed youth; etc. Households headed by women that depend on sons, brothers, and others for support will also be identified. Similarly, households with elderly or seriously ill or disabled persons will be identified. Vulnerable people and households will be eligible for additional support.

Identification of the resettlement impacts of the project to the directly affected persons was inventoried and an asset register detailing the assets likely to be affected and the likely damage was generated and prepared as part of this report.

4.2 Social characteristics of PAPs

This socio – economic characteristics of the PAPs will be incorporated in the final RAP upon conclusion of the analysis of the collected data.

CHAPTER FIVE: PUBLIC CONSULTATION AND PARTICIPATION

5.1 Introduction

The overall goal of consultation and stakeholder engagement is to establish an on- going, accessible and constructive dialogue with potentially affected parties and other interested organizations and individuals, so that their views and concerns can be taken into account in decisions about the Project in accordance with international good practice.

In line with the relevant resettlement requirements, consultation with and participation of affected communities and individuals are key elements of the RAP development and implementation process. One essential aspect of this approach is the establishment of a robust process to redress the grievances of affected people. Consultation with the affected population and with officials of local government, civil society and other representatives of the affected population is essential in order to achieve an in-depth understanding of types and extents of Project impacts as well as of required measures for mitigation and enhancement (livelihood restoration measures).

The design of this RAP partially draws upon consultation activities, which were performed during the development of the RAP for the Dam Project. The main objective for the consultation process was to involve the stakeholders at the very early stages so as to get their opinion on the proposed project, identify likely negative impacts and find ways to minimise negative impacts and enhance positive impacts of the project.

5.2 Stakeholders

During the preparation of this RAP, a number of stakeholders were consulted. The main groups of stakeholders are:

5.2.1 Potential Directly Affected People

These are the people who reside in the area or derive their livelihood from the affected land. These people will lose their property to the project through compensation of physical assets, trees and crops.

Consultative PAP/Community meetings were conducted to inform the community of the project and its benefits/impacts and the same documented in the RAP.

5.2.2 Government Agencies

During the scoping process, some of the key stakeholders consulted included:

- Kenya Forest Service (KFS);

- Water Resource Users Associations (WRUA) for Gatamayu sub-catchment;
- National Government Administration Officers for Kinale location and
- Kenya Wildlife Service(KWS)

The initial comments from these stakeholders were:

- Increased degradation of the catchment due to settlement and human activities upstream of the proposed dam area. Strategies for conservation of the catchment should be prioritized;
- The water levels within Gatamayu rivers has been on the decline due to the destruction of the various springs which act as the main sources of water for Gatamayu River;
- The forest cover (about 50 Ha) will be lost due to cutting of trees to pave way for the construction of the dam. In order to mitigate this, KFS and AWWDA will undertake to rehabilitate sections of the forest that are degraded. Sufficient funds should therefore be allocated for the same.
- Community water supply projects should be considered to serve the communities neighboring the proposed dam site;
- There was evidence of Plantation Establishment and Livelihood Improvement Scheme (PELIS) system taking place whereby the KFS allows communities living adjacent to the forest, through community forest associations (CFOs) the right to cultivate agricultural crops during the early stages of forest plantation establishment. Some of these communities will be affected and will need notice to vacate the area once construction commences; and
- The conservation areas adjacent to the forest has been alienated and title deeds issued. There is therefore need to degazette the area and conservation activities undertaken.

Kenya Wildlife Service (KWS) were also consulted and requested to undertake a site visit to the proposed intake which was undertaken 27th and 28th of June 2017. From the site visit, they gave a go-ahead for the project to be implemented.

CHAPTER SIX: VALUATION OF AND COMPENSATION FOR LOSSES

The RAP aims to ensure that all affected parties are compensated and assisted in restoring their livelihoods. Overall objectives of the RAP are:

- Avoid or at least minimize involuntary resettlement;
- Mitigate adverse social and economic-impacts from construction of the project by:
    a) Providing compensation for loss of assets at replacement cost; and
    b) Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- Improve or at least restore the livelihoods and standards of living of affected people and
- Provide additional targeted assistance (e.g., job opportunities) to improve or at least restore their income- earning capacity, production levels, and standards of living to displaced persons whose livelihoods or income levels are adversely affected.

This section describes the methods used in valuation of land, trees, crops and structures eligible for compensation consistent with either Kenyan laws or policies.

6.1 Inventory of Assets and PAPs

In order to prepare for compensation and other resettlement benefits, it was imperative that a comprehensive asset and affected persons inventory in the designated areas for the different project components be carried out.

The inventory was conducted by a multidisciplinary team composed of the following persons: - Project Team Leader, Surveyor, Valuation Expert and Sociologist. In addition to this team, respective Location and Sub Location Chiefs plus village leaders were present to witness the process.

6.2 Valuation Procedure

At each affected land/plot, the Valuer took count/measurement of all trees in the presence of the affected person and a local leader.

Standing crop and trees compensation

Standing trees compensation procedure was be guided by the ministry of agriculture guidelines. The trees (which include eucalyptus and gravellier) were inventoried. As for the crops, prior 3 months' notice to clear will be issued to the owners of the developments to cease from practicing agricultural activities in the identified proposed sites especially at the dam site.

6.3 Land Survey

The Surveyor demarcated the boundary of the project land required for construction of the dam. The dam footprint will be situated within the forest however, the reservoir will stretch out to the settlement area which was previously demarcated as a conservation area. The proposed water treatment plant is also located within the forest area. The land requirement for the dam is 45acres.

6.4 Socio-economic profile of each PAP

Structured questionnaires were administered by a team of trained Research Assistants in order to document each Project Affected Person's profile. The questionnaires will be entered into SPSS and analyzed to estimate the magnitude of the impacts and for monitoring purposes.

6.5 Computation of Compensation Packages

Valuation and calculation of the affected property was based on Market rates approach and replacement cost approach. The report will be submitted to NLC who have the mandate to acquire land for public use for the acquisition process for assets to commence.

6.6 Forms of Compensation

Compensation shall be done in cash compensation form and will be in Kenyan local currency.

6.7 RAP implementation cost

The total cost for the implementation of the A- RAP will be **Kshs. 17,485,354.40**

CHAPTER SEVEN: ELIGIBILITY AND ENTITLEMENT MATRIX

7.1 Introduction

In order to capture all households affected by the dam and water supply system, a census was conducted in the format of a questionnaire based socio-economic household survey. The census questionnaires in general comprised two parts;

- Part A: socio-economic household information, inventory of affected assets
- Part B: results of topographic survey of affected plots – area of plots and crops grown on plots-(GPS-based)

Heads of households were interviewed on the overall situation of their household, their affected assets; their land under cultivation as well as the respective crops. Businesses survey focused on the inventory of expected losses and the establishment of revenue losses due to the Project. Fieldwork in potentially affected villages was carried out in order to

- Establish arable land use at household level;
- Establish for each village a list of households and area of land used through consultations with the village leaders, and dam committee and
- Conduct village meetings.

Consultations of households in the villages, which will be affected by project construction activities especially the dam, were undertaken with an aim to:

- Meet affected households in order to document the assets that would be lost, and
- Confirm preferred options for compensation (land for land-or cash compensation) and acknowledge the cut-off date.

This section sets out the eligibility criteria for the different categories of PAPs who will be affected by the water supply project for resettlement and benefits.

The involuntary taking of land, results in relocation or loss of shelter and loss of assets (trees) or access to assets or natural resources or loss of income sources or means of livelihood, whether or not the PAPs must move to another location.

The PAPs are to be provided with resettlement assistance and other assistance, as necessary, if they occupy or use the project area prior to the cut-off date. Persons who encroach on the area after the cut-off date are not entitled to compensation or any other form of resettlement assistance.

All PAPs with formal titles or legal rights are eligible for some kind of assistance if they occupied the land before the cut-off date. Persons who occupy the area after the socio-economic study (census and valuation) are not eligible for compensation or any form of resettlement assistance.

7.2 Cut-Off Date

The entitlement cut-off date refers to the time when the valuation assessments of the assets/ developments on the affected area and a census of all the affected people begins. The date of the census will serve as the cut-off date for eligibility and no new arrivals in the project area or assets created after the cut-off date will be eligible for compensation after this date.

The Cut- off Date for implementation of the A- RAP is **18th December, 2020.**

All the PAPs were informed of the cut-off date and its implications. Information about the cut-off date was disseminated mainly through public meetings and during the socio-economic survey.

7.3 Eligibility for resettlement/relocation

Assets, including structures surveyed in the project affected area at the cut-off-date will be eligible for compensation, if these assets (trees), structures are determined as project affected. People residing or holding affected assets (trees) in the project-affected area at the cut-off date will be eligible for compensation. The types of impacts which will be considered eligible for compensation are:

1. Loss of crops;
2. Loss of land and loss of improvements on land and
3. Loss of structures.

7.4 Overview of Entitlements

Entitlements for compensation will refer to the affected household as a joint entity rather than to the head of household considered as an individual. In a bi-parental family, both spouses will be considered as entitled to cash compensation and both are intended to be beneficiaries of livelihood restoration measures; respective procedures. An entitlement matrix is given in the table:

Table 8. Entitlement matrix

Land and Assets	Types of Impact	Person(s) Affected	Compensation/Entitlement/Benefits
Agricultural land	Less than 20% of land holding affected remains economically viable.	Farmer/ title holder	Cash compensation for affected land equivalent to replacement value or Market value
Residential Land	Land used for residence partially affected, limited loss Remaining land viable for present use.	Rental/ lease holder	Cash compensation equivalent to 10% of lease/ rental fee for the remaining period of rental/ lease agreement (written or verbal)
		Title holder	Land for land replacement or compensation in cash according to PAP's choice. Land for land replacement shall be of minimum plot of acceptable size under the zoning law/ s or a plot of equivalent size, whichever is larger, in either the community or a nearby resettlement area with adequate physical and social infrastructure systems as well as secured tenure status. When the affected holding is larger than the relocation plot, cash compensation to cover the difference in value. Transfer of the land to the PAP shall be free of taxes, registration, and other costs.

Land and Assets	Types of Impact	Person(s) Affected	Compensation/Entitlement/Benefits
			Relocation assistance (costs of shifting + allowance)
	Land and assets used for residence severely affected Remaining area insufficient for continued use or becomes smaller than minimally accepted under zoning laws	Rental/ lease holder	Refund of any lease/ rental fees paid for time/ use after date of removal. Cash compensation equivalent to 3 months of lease/ rental fee. Assistance in rental/ lease of alternative land/ property. Relocation assistance (costs of shifting + allowance)
	Land and assets used for residence severely affected Remaining area insufficient for continued use or becomes smaller than minimally	Owner	Cash compensation for affected building and other fixed assets. Cash assistance to cover costs of restoration of the remaining structure

Land and Assets	Types of Impact	Person(s) Affected	Compensation/Entitlement/Benefits
	accepted under zoning laws		
Buildings and structures	Structures are partially affected Remaining structures viable for continued use	Rental/ lease holder	Cash compensation for affected assets (verifiable improvements to the property by the tenant). Disturbance compensation equivalent to two months rental costs
		Owner	Cash compensation for entire structure and other fixed assets without depreciation, or alternative structure of equal or better size and quality in an available location which is acceptable to the PAP. Right to salvage materials without deduction from compensation Relocation assistance (costs of shifting + allowance) Rehabilitation assistance if required (assistance with job placement, skills training)
	Entire structures are affected or partially affected Remaining structures not	Rental/ lease holder	Cash compensation for affected assets (verifiable improvements to the property by the tenant). Relocation assistance (costs of shifting + allowance equivalent to four months rental costs). Assistance to help find alternative rental arrangements

Land and Assets	Types of Impact	Person(s) Affected	Compensation/Entitlement/Benefits
	suitable for continued use		Rehabilitation assistance if required (assistance with job placement, skills training)
		Squatter/ informal dweller	Cash compensation for affected structure without depreciation Right to salvage materials without deduction from compensation Relocation assistance (costs of shifting + assistance to find alternative secure accommodation) to area where he/she can live and work legally preferably in the community of residence through involvement of the project Alternatively, assistance to find accommodation in rental housing or in a squatter settlement scheme, if available) Rehabilitation assistance if required assistance with job placement, skills training)
		Street vendor (informal without title or lease to the stall or shop)	Opportunity cost compensation equivalent to 2 months net income based on tax records for previous year (or tax records from comparable business, or estimates), or the relocation allowance, whichever is higher. Relocation assistance (costs of shifting) Assistance to obtain alternative site to re- establish the business.

Land and Assets	Types of Impact	Person(s) Affected	Compensation/Entitlement/Benefits
		PAP (whether owner, tenant, or squatter)	Cash compensation equivalent to average of last 3 years market value for the mature and harvested crop.
Standing crops	Crops affected by land acquisition or temporary acquisition or easement	PAP (whether owner, tenant, or squatter)	3 months' Notice will be issued to the PAPs to clear from the identified area.
Trees	Trees lost	PAP (whether owner, tenant, or squatter)	Cash compensation for any assets affected (e. g. trees removed)
Temporary Acquisition	Temporary acquisition		In kind replacement or compensation at replacement cost for land and structures

CHAPTER EIGHT: RAP ORGANIZATIONAL PROCEDURE AND IMPLIMENTATION SCHEDULE

8.1 Organizational procedure

The proposed project will be under the administrative authority of the AWWDA as the implementing agent. Policy and strategic decisions involve the following Ministries:

- ✓ Ministry of Water, Sanitation and Irrigation
- ✓ The National Treasury
- ✓ Ministry of Environment and Forestry
- ✓ Ministry of Lands and Physical Planning
- ✓ County Government of Kiambu

8.1.1 Resettlement Implementation Team (RIT)

AWWDA will establish a RIT, comprising a Sociologist, Surveyor, Environmental specialist, Engineer, Land valuer and Legal officer to manage the RAP process.

Roles and responsibilities

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. crops/trees;
v. Deliver prompt compensation/resettlement;
vi. Be a member of the grievance procedure; and
vii. Monitoring, evaluation and reporting.

8.1.2 Resettlement Working Group (RWG)

The A-RAP will be implemented in partnership with various relevant government agencies. The Resettlement Working Group (RWG) will comprise the community liaison officer (AWWDA), local leaders and Kiambu county government representatives. The roles and responsibilities of the RWG will include but not limited to:

- ✓ Act as the primary channel of communication between the various interest groups/organizations involved in the resettlement process;
- ✓ Serve as communication link between AWWDA and the PAPs; and

- ✓ Serve as the court of first appeal to solve problems that arise during RAP's implementation.

8.1.3 Local PAP Committees

The PAPs committee acts as a link between the various communities and AWWDA. PAP committee shall comprise:

- ✓ Chairperson elected by the PAPs
- ✓ Secretary elected by the PAPs
- ✓ 3 members elected by the PAPs (a male, a female and youth)
- ✓ Local Area Chief

8.2 Implementation schedule

The RAP anticipates that the project implementation schedule will consist of three phases namely Preparation, Implementation and Post-implementation.

The resettlement schedule will be coordinated with Resettlement Implementation Team (RIT). The activities prior to construction are outlined in the following table below.

Table 9. RAP Implementation schedule

Task Name	Duration
Project duration	**267 days**
Preparation of the Final RAP report	8 days
Constitution of RIT and RWG	1 day
Validation process by valuer and RIT	4 days
Community consultation	4 days
Constitution of RAP PAP committee	2 days
National Land Commission – Compulsory Acquisition Process	180 days
Redress of Grievances	34 days
Submission of project completion report by RIT	7 days
Monitoring and Evaluation	27 days
Deliverables	**267 days**
Final RAP report	0 days
Project completion report	0 days
Monitoring and Evaluation report	0 days

CHAPTER NINE: GRIEVANCE REDRESS MECHANISM

9.1 Introduction

During the implementation of the project activities it is likely that disputes/disagreements between the project implementers and the affected persons will occur especially in terms of boundaries, ownership of properties, compensation values and delay in disbursement of the compensation packages. It will therefore be necessary to establish channels through which aggrieved people shall file their complaints so as to ensure successful project development and implementation. The project RAP team to be established by AWWDA (including a RAP Specialist, Land Surveyor and Property Valuer) will establish grievance redress mechanisms.

The grievance redress procedures will provide opportunity for PAPs to settle their complaints and grievances amicably. The procedure to be adopted will allow PAPs not to lose time and resources from going through lengthy administrative and legal procedures. This will be set up through Local Authorities, including a Resettlement Committee and through community leaders. The grievance mechanisms shall:

- Provide an effective avenue for expressing concerns and achieving remedies for communities.
- Promote a mutually constructive relationship between the project and the community or PAPs.
- Prevent and address community concerns.

9.2. Grievance Mechanisms

The Land Act 2012 and National Land Commission Act 2012 obligate NLC to manage grievances and disputes related to resettlement or land amicably. NLC will be expected to arbitrate or negotiate with PAPs or landowners that have any grievances concerning their compensation. The structures they put in place are also expected to take up this responsibility.

This RAP thus will use the following grievance resolution mechanisms.

Grievance Resolution Committee

The grievance committee is at the local level and this constitutes the following people;

- Location Chief;
- Sub Location Chief;
- Village leader;
- Three representatives of Project Affected Persons (1 Male, 1 Female and 1 Youth);
- A representative from county government of Kiambu.

Complaints of PAPs on any aspect of compensation or addressed losses shall first be lodged either in writing or orally to the committee or project liaison officer (who receives grievance and process), which will be resolved by use of customary rules and existing grievance resolution mechanisms. The Grievance Resolution Committee will try as much as possible to arrive at a compromise for the complaints raised. This will be obtained through series of conciliations, mediations and negotiations exercises conducted with the PAPs. If the grievance is not resolved, the case will be forwarded to Resettlement Working Group (RWG).

This committee will sit at the chief's office in Kinale location. The following procedure will be followed:

1. *Registration of grievance:* an aggrieved party registers a grievance at the Chief's office or with project liaison officer using a "Grievance Registration Form" and within two working days the committee meeting is convened by the chair. (See appendix III for a sample of the Grievance Registration Form);
2. The secretary of the committee will log in the Grievance into the *Grievance Register* and the aggrieved person informed of the scheduled hearing. A maximum of 7 working days shall be given between the date the case is recorded and the date when the hearing is held;
3. The committee will be *meeting on a weekly* basis to deal with emerging cases. At these meetings, hearings with the affected persons and related witnesses will be held;
4. The committee will communicate its judgement to the affected persons within 7 days (See appendix IV for a sample Resolution Form);
5. If there is no resolution at this stage the committee through the chair moves the case to the next level. This will be done within 7 days after the hearing;
6. If the PAP is not satisfied with the judgement, he or she will be allowed to move the case to the next level.

Resettlement Working Group (RWG)

RWG as discussed in section 8.1.2 will comprise AWWDA representative, area chief and Kiambu county government representatives comprising the County Executive Committee (CEC) in charge of land and environment, water and other relevant departments. The team will receive the grievance for deliberation from the grievance resolution committee. If unresolved the grievance will be forwarded to the RIT.

Resettlement Implementation Team

The project implementation team shall comprise the AWWDA staff involved in the project for example; sociologist, environment officer, resident engineer and a legal officer among others.

The project implementation team will receive and verify the claims on the ground with the assistance of the grievance committee. If unresolved then the case will be forwarded to the Land and Environmental Court or High Court.

Land and Environmental Court or High Court

The constitution allows a right of access to courts of law by any person who has an interest or right over property. The aggrieved PAP not satisfied with the decision of the Committee will submit the case to courts of law as a last resort. However, this will only happen after all amicable ways to resolve the grievance have failed.

9.3. Grievance Resolution Process

PAPs will be consulted about the different approaches to resolving grievances during the sensitization meetings and the different grievance mechanisms in place for them to lodge their complaints and dissatisfactions. The grievance procedure will be simple and administered as far as possible at the local levels to facilitate access, flexibility and ensure transparency. All the grievances will be channelled via the Grievance Resolution Committees. Complaints will be received in writing or orally and will be filled in a Grievance Registration Form by the committee.

The steps for grievance redress are as follows:

First step:

Registration of the grievances with the Grievance Resolution Committee as discussed in section 8. The committee will seek to eliminate nuisance claims and engage with legitimate claimants endeavouring to reconcile the aggrieved PAP(s) concern or depending upon the issue to negotiate for a resolution. Where the complaint and grievance cannot be resolved by the committee, the complaint is referred to the RWG.

Second step:

The RWG receives grievance forwarded by the committee concerning the aggrieved PAP(s) to negotiate and possible resolution. The RWG having heard the concern, the meeting will respond to the aggrieved PAP(s) within two (2) weeks of the date of the meeting. Where the complaint and grievance cannot be resolved by the RWG, the complaint is referred to the Resettlement Implementation Team (RIT).

Third step:

Where the complaint and grievance cannot be resolved by the RWG, the complaint is referred to the Resettlement Implementation Team (RIT).

Fourth step:
In instances where the RIT 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.

Fifth step:
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 the right that government or one of its agents has the right to take property for public use following prompt and adequate compensation being paid, among other things.

The decisions of the action to be taken will be communicated to all involved parties mainly in Grievance resolution form. All measures will be undertaken to ensure that the grievance is solved amicably between the concerned parties and the courts will be the last resort. Efficiency in solving of the grievances will be of paramount importance.

The above steps are summarised in Figure 5.

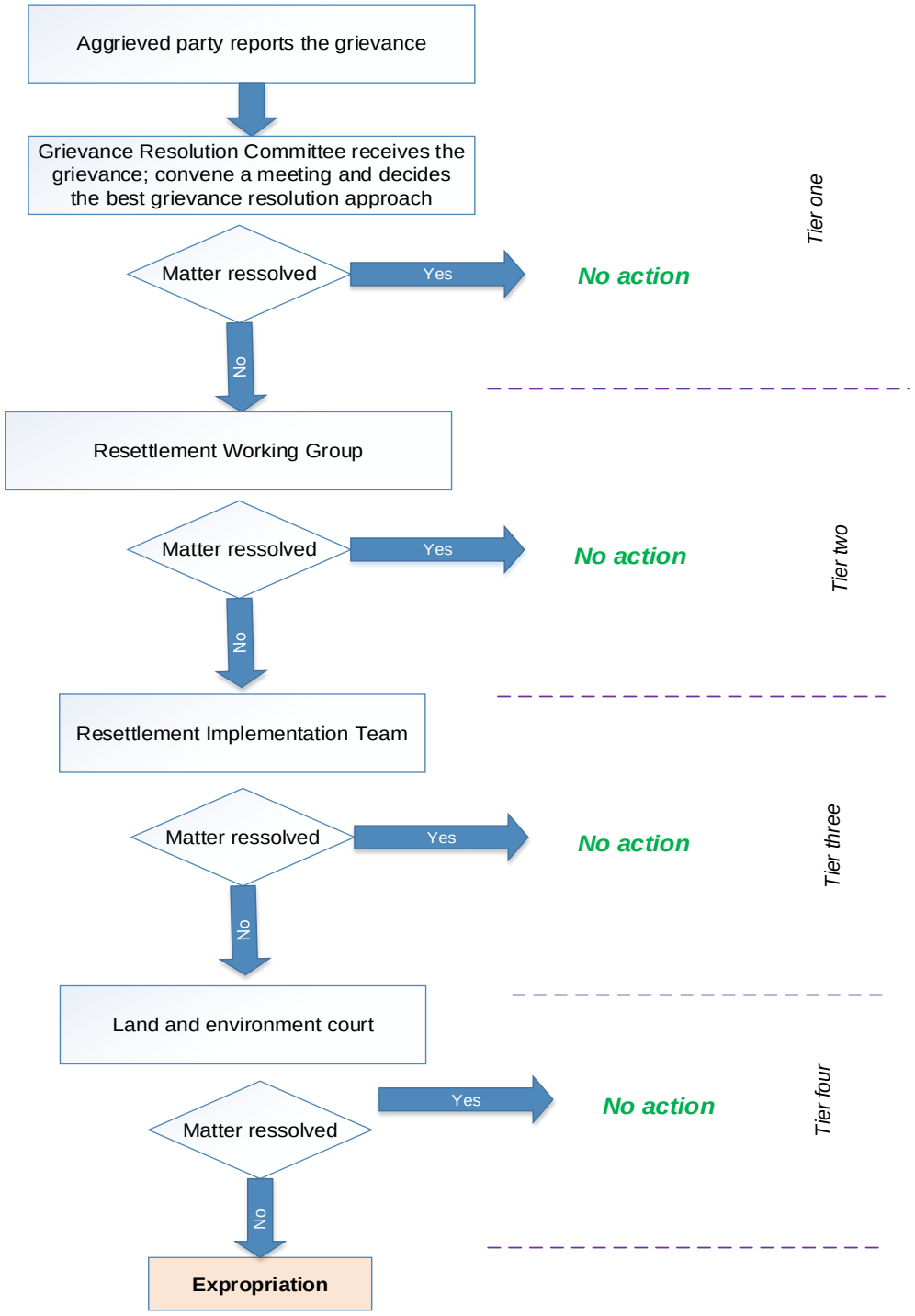


Figure 5: Grievance redress procedure

9.4. Monitoring Complaints

In addition to the Grievance Resolution Form, a Grievance Log will be kept by the project implementers indicating the date the complaint was lodged, actions to be taken and personnel or team responsible for the complaint. A Project Liaison Officer or Resettlement Expert for the project will monitor and document the progress of all complaints through monthly RAP implementation status reports.

CHAPTER TEN: MONITORING AND EVALUATION

In order to guarantee that the compensation plan is smoothly performed and the interests of the affected persons are well taken care of, the implementation of the resettlement action plan will be under monitoring throughout the whole process. Monitoring will be divided into two parts, i.e. internal and external monitoring.

10.1 Internal monitoring

The internal monitoring will be performed by AWWDA. The target of internal monitoring is to ensure that there is overall fairness and transparency while compensation process takes place and Resettlement Action Plan is performed based on legal rights.

The main monitoring centre would be compensation allocation schedule, payment and use of compensation fee, implementation of the policies and regulation specified in the resettlement plan and the whole course of implementation of the compensation.

The main source of data for internal monitoring will be the data base generated from the RAP for records on compensation of assets as well as the day today observations by implementing staffs. The client's team will record the progress of land allocation and resettlement. They will make a summary report starting from the commencement of the activities and special events will be reported on continuous basis.

10.2 External Monitoring

External monitoring will be conducted through a contracted independent and qualified consultant. The consultant will visit the project area on a quarterly basis.

The consultant will ensure that:

- Monies paid to households who have lost crops and other forms of livelihood production have received fair compensation
- Where land has been permanently acquired for the project, households affected have been afforded fair compensation.
- The grievances raised by stakeholders, notably PAPs, have been settled within the stipulated timeframe without delay including the effectiveness of the compensation delivery system.
- Review the results of internal monitoring and review overall compliance of RAP

The consultant must write its reports before the end of each visit and submit them to AWWDA and the RAP committee.

10.3 Monitoring Indicators

The table below shows the monitoring indicators:

Table 10. Monitoring indicators

Subject	Indicator	Variable
Land	Land acquired	✓ Area of cultivation land acquired ✓ Developments ✓ Area of private land acquired ✓ Approvals sought for use of government land
Buildings/ Structures	Number of other structures to be demolished/relocated	✓ Number, type and size of other structures demolished/relocated
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 and type ✓ Compensation amounts for the crops destroyed
Compensation, Re-establishment and Rehabilitation	Number of PAPs compensated	✓ Number of individuals affected ✓ Number of owners compensated by type of loss ✓ Amount compensated by type and owner
Hazards and Disturbances	Number of complaints received from PAPs	Number of households affected by hazards and disturbances from construction (excavation of trenches, noise levels, blasting, increased traffic levels)

CHAPTER ELEVEN: CONCLUSIONS

The proposed construction of Kinale dam water supply by AWWDA in Kiambu County will improve access to potable water by the community. Provision or additional water supply has potential to un-lock the economic potential of rural areas and thus contribute to national economic growth.

This A-RAP report has been prepared in consistency with the applicable policy provisions of Kenyan Government Resettlement. Implementation of the project will not have significant impacts on the environment and social setting of the areas. The distribution pipelines are located within the road reserves and the dam and treatment plant located within the Kinale and Kereita Forest Reserves where all the necessary authorizations for the works shall be sort from Kenya Forest Service (KFS) prior to works commencement.

A section of the dam reservoir is encroached with farmers practising subsistence agricultural activities. Prior notices will be issued for the farmers to clear their assets from the area however the trees planted will be inventoried and valued. De – Gazettement of the area previously alienated as a conservancy area for the forest needs to be done as the land has been titled and allocated

APPENDIX

i. Minutes of Meeting with KFS;
ii. Public consultation minutes and attendance sheet;
iii. Asset Register;
iv. Grievance registeration form;
v. Sample grievance and resolution form;
vi. Sample questionnaire to be used to collect data

APPENDIX I: CONSULTATION MINUTES - MINUTES OF MEETING WITH KFS

PROJECT:	**PROPOSED CONSTRUCTION OF KINALE DAM & WATER TREATMENT PLANT**
DATE AND TIME:	21 March 2020 1130 Hrs
MEETING PLACE:	KENYA FOREST SERVICE OFFICE, KINALE
PRESENT:	As per the attached attendance list

AGENDA

1. Introduction
2. Brief Description of the Project
3. Sites Proposed
4. Surveys Works
5. Way Forward

1. Introduction

The Chair welcomed all the members to their Kinale Forest Office and requested attendees to introduce themselves and thereafter invited the Agency's Chairperson to give his opening remarks.

2. Brief Description of the Project

The Chair invited AWWDA staff i.e. Albert Ocharo to give a brief description of the project to the attendees so as to give an understanding. The meeting was informed that the proposed water supply project involve construction of a new dam to supply water to the project areas of Lari and Limuru. Kinale earth embankment dam in with a maximum height of 34m and 20m respectively. The Objective of the project is to supply potable and adequate water to Lari and Limuru Sub-Counties through an integrated sustainable water scheme.

3. Sites Proposal and Scope

It was further explained that the proposed site would involve the construction of the Dam structure along Gatamaiyu River (Core clay and rock fill shell materials), spillway (Morning glory), RC diversion culvert, intake tower, draw-off, tower Access Bridge, access road and Conventional full treatment plant with a capacity of 30,000 m3/day. This include the offices, operators' houses, and a 12,000m^3 storage tank.

It will also consist of a raw water mains 500mm internal diameter (Steel pipe), 8 km long through the forest area to the proposed treatment plant at the edge of the forest. Distribution mains will also be laid from the treatment plant along Nakuru-Nairobi highway (A104) upto Uthiru.

4. Surveys to be Carried Out

For smooth flow and accurate data collection it was agreed that thorough survey works should be carried out so as to determine the project sustainability and viability. The main survey works would include; Ground survey & Hydrological survey.

It was agreed that KFS will undertake the assessment for both Option 1 and 2 to enable them make an informed decision. The tree assessment would cover the dam area approx. 48Ha, raw water pipeline approx. 1.8 Ha and Treatment Plant Approx. 2Ha.

It was reported that AWWDA was in the process of undertaking an Environmental and Social Impact Assessment Study to be submitted to NEMA for review and approval.

5. Way Forward

i. It was agreed that a joint field survey to be carried out by both the AWWDA team and the KFS official so as to have the reservoir limits pegged to facilitate the forest inventory process.
ii. AWWDA team was to finalize on the total acreage that will be required after the survey process.
iii. KFS noted that AWWDA should consider rehabilitating sections of the forest that are degraded at 2X the total area that will be taken by the proposed Kinale Dam Water Project.
iv. It was advised that there should be sufficient allocation of funds for the conservation activities.

The meeting ended at 1230hrs

Signed by:

…….. Date …….

Albert O. Ocharo

ATHI WATER WORKS DEVELOPMENT AGENCY

…….. Date …….

Benedict Omondi

KENYA FOREST SERVICE

APPENDIX II: PUBLIC CONSULTATION MINUTES AND ATTENDANCE SHEET

RESSETLEMENT ACTION PLAN IMPACT ASSESMENT FOR THE PROPOSED KINALE DAM WATER SUPPLY IN KIAMBU COUNTY

MINUTES OF PUBLIC CONSULTATION FORUM NO. 1 WITH STAKEHOLDERS HELD ON 19TH NOVEMBER 2020.

ATTENDANCE LIST

Attached

AGENDA

1. Introductions
2. Brief on AWWDA and its mandate
3. Brief on project scope/nature of works/duration/beneficiaries
4. Grievance Redress Mechanism – Grievance desk/Procedure
5. Deliberations(Q&A)
6. Closing Remarks

1/1/2020: PRELIMINARIES.

- The meeting was called to order at 10.00am by the Area local administration after which prayers were led by one of the community members.
- The meeting was informed by the area local administration that, Athi Water Works Development Agency (AWWDA) had informed them of the proposed Kinale Dam project and further requested through the administration's office to facilitate in holding a public consultative forum with the area residents within Kinale location.

2/1/2020: BRIEF ON AWWDA & ITS MANDATE

- The meeting was informed that AWWDA is a state corporation under the Ministry of Water, Sanitation and Irrigation whose mandate is development of bulk water and sewerage infrastructure within its area of jurisdiction (which is Nairobi, Kiambu and Murang'a counties).

3/1/2020: PROJECT SCOPE/NATURE OF WORKS/DURATION/BENEFICIARIES.

- AWWDA informed the members present of the proposed Kinale Dam Water Supply project which entailed construction of an earth filled dam within Kinale & Kereita forest, raw and treated water transmission pipelines to be laid within the forest area and the road reserves respectively and a water treatment plant located within the forest as well.
- The proposed project purpose is to serve the residents of Limuru town, Kimende, Kwambira and Ndeiya towns where off takes shall be made to feed the existing pipelines in towns. In addition, the residents around the proposed dam site would also be served by the proposed project.
- The meeting was informed that prior to commencement of any project, public participation forums are mandatory to inform the public of the proposed works and have consultative sessions with the potential affected persons and the public to get their opinions and views.
- This would also form a basis of informing the public of the expected impacts to the area residents and the proposed mitigation measures.
- It was communicated that prior to commencement of the project, an Environmental and Social Impact Assessment report will be prepared for further submission to NEMA for licensing of the project.
- Further a Resettlement Action Plan would be developed for the project detailing the social impacts of the project, project affected persons, affected assets inventory (where applicable) and a socio economic baseline survey for the affected communities. The findings of the baseline survey would form part of the ESIA report and RAP.
- Valuation of the affected assets would be carried out on a date communicated in advance through the local administration office.
-

4/1/2020: GRIEVANCE REDRESS MECHANISM

- The PAPs were informed pending formation of a grievance committee for the proposed project. The local administration office would stand in as the grievance desk for the project and all issues/complaints/concerns to be raised at the office for further action by the project team in cases where their intervention/response is required.

5/1/2020: DELIBERATIONS

1. **Will compensation for trees within the conservation area be carried out**

- An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.

2. **Will they be allowed to retain trees that were valued and compensated**

- The PAPs were informed that they could retain the compensated assets.

3. **The proposed dam would cut access to parcels of land which extent to both sides of the ridge**

- In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.

4. **What is the extent of the dam**

- The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.

5. **The dam poses as a security risk to the residents of the area especially children, what measures will be taken**

- Upon completion of the construction works for the dam, the implementing agency will permanently fence off the dam area. There will be restricted access to the dam.

6. **Will there be employment opportunities for the community**

- Once the construction works commence, the community will be prioritized with regards to employment opportunities available

7. **What is the required distance for the buffer zone**

- The proposed project will consider a buffer zone of 30m

8. **In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider**

- If the land is greatly affected, full acquisition will be carried out for the parcels.

9. **Who will carry out the land acquisition for the project**

- AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project

10. **What measures are in place to address the micro-climate change that will be caused by the dam**

- The PAPs were informed the proposed dam will not have a significant change in the micro-climate conditions in the area.

11. **Will the residents/landowners around the dam be served by the dam?**

- The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing boreholes would be done to boost the quantity of water further.
-

6/1/2020: WAY FORWARD

- The public was informed that a follow up meeting with the potential identified PAPs would be carried out and the date communicated through the area local administration office. The specific affected persons were urged to be in attendance.
- There being no other business the meeting ended at 12.00pm

SIGNED

NAME:……

…… Date……...

Signature: Area Chief

NAME:……

…… Date ……...

Signature: Athi Water Works Development Agency

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/NOVEMBER/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
1.	VIENNA W. KIBUKOSA.	AWWDA.	29218580.	0715088292.	
2.	BRIAN MUNENE	LIWASECO	30204297	0116522806	
3	BISHOP GOTHAMBUGUA	KINALE	3068036	0722913847	
4	JOHN M. NJOROGE	KINALE	8519507	0724961385	
5.	JOSEPH M. MBUGUA.	KINALE	4317090	0725410897.	
6.	IVY WACHUI GATHII	AWWDA	32450653	0715777622	
7	STEPHEN MUGO MUTURI	KINALE	34289713	0792847745	
8	GEOFFREY KIMANI KINYANJUI	"	18864461	0722 270 944	
9	PETER KARIUKI	"	31690679	0792582778	
10	PATRICK Kimani Kinyanjui	KINALE	35 633 714.	07 46. 327 684.	
11	SAMUEL MBATIA GIKUNI	KINALE	344 7760	0718 082 148	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ---------/---------/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
12	DOMINIC K. KARUGA	KINALE	13533508	0723410647	
13	PETER NDUNG'U IHIGA	"	22020485	0707566941	
14	JOHN KAMAU	"	9722538	0721815481	
15	DOMINIC KIMANI	"	23135508	0725947041	
16	SAMUEL NDUNG'U	"	12530190	0723289341	
17	JONATHAN KABANJA	"	2761 5240	0724636570	
18	MICHAEL K. WAMBUGU	"	27517318	0725377477	
19	PETER MATHENGE	"	36438398	0797088025	
20	PETER WAIGONGO	"	6850070	0727210469	
21	FRANCIS KIRUGO	"	38038126	0759008423	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/11/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
22	PATRICK. K. GIKONYO	KINALE	21438460	0724145629	
23	STEPHEN KIARIE THADI	"	24613340	0742439468	
24	TOM GICHO WAIRIMU	"	29217801	0702688226	
25	SIMON KARANJA	"	22261506	0701065124	
26	JOSHUA NJOROGE	"	2570997	0723816216	
27	DAVID KARANJA WANGOMBE	"	21845023	0721316124	
28	STEPHEN MAINA KARANJA	"	12941930	0728622129	
29	JOHN MUNYAMBU	"	26602425	0728473926	
30	JOHN KAMARE	"		0713955042	
31.	Simon Mureithi Kanan	"	28456223	0704593470	
32.	PETER GICHANGA MUNYOIKE	"	34062265	0704087192	
33.	JOSEPH NDUNG'U MACHARIA	"	23338192	0790990	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: 19/11/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
34	FRANCIS MUHIA	KINALE	4664263	0713983842	
35	ABRAHAM KARANJA	"	34711380	0714436151	
36	MOSES NGUGI	"	13029028	0724690207	
37	SAMUEL KARIUKI	"	22739160	0723254809	
38	LOISE NYAMBURA	"	6233094	0724447064	Loice
39	ZACHARIAH CHEGE	"	26703433	0746999540	Mwangi
40	Arthur Mwangi	"	35863123	0797481730	
41	HAMAN MUIRURI	"	37227427	0726619977	
42	Amos NGIGE	"	22104793	0728954511	
43.	JOSPHAT MUTUA	"	31767874	0714241933	
44.	DAVID MWANGI	"	21549435	0721604866	
45.	JOHN GITUBIA	"	29093799	0757630449	
46.	FRANCIS KIMANI	"	35741648	0703668487	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----17----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
47.	Hezekiah Wakisaberya	Kinale	34928548	0721 954 856	~~Hezekiah~~
48.	PETER KAMAU M.	"	24933460	0724 306 496	
49.	JANDAYO MUNG'ARA	"	28015028	0727 110 719	~~Zhad~~
50.	DENNIS KIAKIERU	"	33447315	0715 396509	
51.	JOHN NJENGA	"	20516383	0710420540	~~JOHN~~
52.	PETER KIAKIERU KIRE	"	27605320	0700862074	
53	CHARLES NYORO KIMANI	"	8748541	0720339505	
54	PETER KINYANJUI MAINA	"	~~4756~~ 4665627	0721647084	
55.	MARY ~~NYAMBURA~~ NYAGURA	"	13727288	0713298467	
56.	ISAAC MATHU	"	11803117	0716392638	
57.	DAVID MUNIU		30719444		
58.	SAMUEL MWANGI		3553198	0741177492	
59.	PETER KINYANJUI		5253206	0715773876	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
60.	MARY KAMAU	KINALE	30714261	0745545782	
61.	RACHEAL KIANJIRU	"	23483512	0795294158	
62	PETER KIMANI	"	22017787	0727873585	
63	JOHN MUTHAMA	"	4209613	0721329287	
64	PAUL NJOROGE GATHITU	"	3114218	0714502646	
65	LAWRENCE CHEGE	"		0798232537	
66	ISAAC CHEGE	"		0727938218	
67	SAKIERIA WAMBUI	"	14514374	0723200225	Swambui
68	MELISA KIANJIRU	"	11531351	0792464902	
69	SIMON GICHUHI		24671089	0703354941	S G M
70	JAMES MWANGI K.		~~2040~~ 1340229	0723854535	
71	SIMON NGOTHO		36076257	0755997208	
72.	PETER NJENGA M.		10424827	0710131334	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
73.	SARAH WANJIRU	KINALE	26691655	0759464082	
74	JAMES KAMAU	"	36729032	0726504067	
75	EDITH WANJIKU	"	28194489	0720281828	
76	SAMUEL GITAHI	"	5252827	0711466943	
77	WALLACE GITAU	"		0716687225	
79	PETER KIBE	"		0743715099	
79	DANSON KARUGA	"	38588155	0713527886	
80	SAMUEL MWANGI	"	37041985	0711607461	
91	JOSEPH MACHARIA	"	30774322	0726987551	
82.	AGNES KIBE		26254187	0707572468	
83.	PETER HUGHI		27272245	0757543307	
84.	ESTHER WANJIRU		30944115	0703215702	
85.	JOHN THUKU		37513956	0719212841	
86.	PHILIP KARANJA		36085070	0790019042	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
87.	PATRICK NJOROGE	KINALE	24644304	0711604996	
88.	JOHN MAINA	"	~~36~~ 26331459	0719 844534	
89	JORAM KANG'ETHE	"	24071070 ~~24077~~	0722106288	
90.	DAVID NDUNG'U	"	23258154	0724469398	
91	PAUL CHEGE	"	13412564	0769223652	
92	PETER KAMAU	"	23480782	0724399056	
93	JOHN NG'ANG'A	"	11389857	0720577837	
94	SILAS KANYANGO	"	12522654	0721646607	
95	PETER KARIUKI	"	29468155	0798556618	
96.	NOAH GATITU		29031515	0714470928	
97.	SAMUEL KAMAU		23380944	0700790590	
98.	STANELY MUGA		34714231	0703901332	
99.	JOHN NJUGUNA		38422347	0745267300	
100.	CECILIA WAIRIMU		34119238	0768763309	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---NO.1--- PAPS ATTENDANCE REGISTER DATE: ---19---/---11---/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
101	DAVID GITHINJI	KINALE	29804671	0707549566	
102	JOSEPH NJOROGE	"			
103	DAVID GICHUKA	"	22591491	0727492237	
104	DICKSON NJENGA	"	6252019	0723171524	
105	PAUL KARIUKI	"	29817171	0726081250	
106	PAUL MBURU	"	23673581	0724346246	
107	ARTHUR MWANGI	"	30605905	0716607759	
108	JACOB KAMAU	"	22649569	0725119758	
109	SIMON KAKIERU	"	24070450	0705961296	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.1 ---------- PAPS ATTENDANCE REGISTER DATE: ----19----/----11----/2020

S/No	NAME	LOCATION	ID No.	PHONE No.	SIGN
110	PETER MACHARIA NDICHU	KINALE	26295174	0794778143 ~~0797794778143~~	
111	PETER GATUNA	"	10344340	0725689541	
112	FREDRICK MBUGUA	"	24543647	0	
113	FRANCIS MUNGAI	"	228[illegible]19219	0724119195	
114	SIMON MUCHIRI	"	11616856	0700597926	
115	ROBERT NJOROGE	"	5782098	0725345424	
116	STEPHEN NYORO	"	~~07~~ 7279942	0722794265	
117	SAMUEL KANJA	"	3640681	0726557135	
118	DAVID NJOROGE	"	13842030	0706911062	
119	Alfred K. Langat	ACC Kinale Division	22940502	0728588706	

RESSETLEMENT ACTION PLAN IMPACT ASSESMENT FOR THE PROPOSED KINALE DAM WATER SUPPLY IN KIAMBU COUNTY

MINUTES OF PUBLIC CONSULTATION FORUM NO. 2 WITH PROJECT AFFECTED PERSONS HELD ON 26TH NOVEMBER, 2020.

ATTENDANCE LIST

Attached

AGENDA

7. Introductions
8. Brief on AWWDA and its mandate
9. Brief on project scope/nature of works/duration/beneficiaries
10. Grievance Redress Mechanism – Grievance desk/Procedure
11. Deliberations(Q&A)
12. Closing Remarks

1/2/2020: PRELIMINARIES.

- The meeting was called to order at 12.00pm by the Area local administration after which prayers were led by one of the community members.
- The meeting was informed by the area local administration that further to the public consultation forum held on 19th November, 2020, Athi Water Works Development Agency (AWWDA requested through the administration's office to facilitate in holding a consultative forum with the affected persons.

2/2/2020: BRIEF ON AWWDA & ITS MANDATE

- The meeting was informed that AWWDA is a state corporation under the Ministry of Water, Sanitation and Irrigation whose mandate is development of bulk water and sewerage infrastructure within its area of jurisdiction (which is Nairobi, Kiambu and Murang'a counties).

3/2/2020: PROJECT SCOPE/NATURE OF WORKS/DURATION/BENEFICIARIES.

- AWWDA informed the PAPs of the proposed Kinale Dam Water Supply project which entailed construction of an earth filled dam within Kinale & Kereita forest, raw and treated water transmission pipelines to be laid within the forest area and the road reserves respectively and a water treatment plant located within the forest as well.
- The proposed project purpose is to serve the residents of Limuru town, Kimende, Kwambira and Ndeiya towns where off takes shall be made to feed the existing pipelines in towns. In addition, the residents around the proposed dam site would also be served by the proposed project.
- Part of the surveyed area for the dam reservoir was situated outside the forest area within the settlements hence there was need to inform the persons within the identified area of the proposed works.
- It was communicated that an Environmental and Social Impact Assessment report will be prepared for further submission to NEMA for licensing of the project and a Resettlement Action Plan would be developed for the project detailing the social impacts of the project, Identified project affected persons, affected assets inventory & valuation report (where applicable) and a socio economic baseline survey for the affected communities. The findings of the baseline survey would form part of the ESIA report and RAP.
- Valuation of the affected assets would be carried out on a date communicated in advance through the local administration office.

4/2/2020: GRIEVANCE REDRESS MECHANISM

- The PAPs were informed pending formation of a grievance committee for the proposed project. The local administration office would stand in as the grievance desk for the project and all

issues/complaints/concerns to be raised at the office for further action by the project team in cases where their intervention/response is required.

5/2/2020: DELIBERATIONS

12. **Who will carry out the land acquisition for the project**
    AWWDA will undertake the RAP for the project which will be submitted to the National Land Commission (NLC) who are the mandated body to acquire land for public use. Further NLC will handle all land disputes (ownership/extent) with regards to the project
13. **What rates will be adopted for compensation of any assets**
    The meeting was informed that the valuer would adopt the current market rates for items valued which will be further subjected to review by NLC who are the mandated body to carry out compulsory acquisition.
14. **Will compensation for trees within the conservation area be carried out**
    An asset inventory would be carried out for all trees affected within the surveyed dam extent area. However, compensation for seasonal crops would not be done. Timely notices will be issued through the local administration office for the PAPs to harvest and cease from further planting within the area.
15. **Will they be allowed to retain trees that were valued and compensated**
    The PAPs were informed that they could retain the compensated assets.
16. **The proposed dam would cut access to parcels of land which extent to both sides of the ridge**
    In case the dam cuts off any individual's access to their land parcel, AWWDA would ensure that another access is created.
17. **What is the extent of the dam**
    The survey for the dam was finalized and the extent of the dam was established and marked on the ground with temporary markers.
18. **In the event a land parcel is greatly affected and a small portion remains, does AWWDA consider**
    If the land is greatly affected, full acquisition will be carried out for the parcels.
19. **Will the residents/landowners around the dam be served by the dam?**
    The proposed project will incorporate installation of a tank at the area which will serve the residents around the dam and further rehabilitation of the existing boreholes would be done to boost the quantity of water further.

6/2/2020: WAY FORWARD

- The PAPs were informed the valuation exercise would be carried out and timely notices through the local administration office and the village elders would be issued. The affected persons were requested to be present for the inventorying activity which would be spearheaded by the valuer.
- There being no other business the meeting ended at 2.00pm

SIGNED

NAME:……

…… Date……...

Signature: Area Chief

NAME:……

…… Date ……...

Signature: Athi Water Works Development Agency

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---NO.2--- ATTENDANCE SHEET DATE: ---26---/---11---/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
01	Daniel Mwaura Waigongo	1/1383	22340451	0724115608	
02	John Kimiriri Waigongo	1/1383	11770096	0701212 5276	
03	patrick Njoroge		21423994	~~0726~~ 0726928576	
04	Paul Mutunga Ngagi	1/2093	24848660	~~0730~~ 0727305716	
05	Peter Kimani Mwangi	1/1326	9058000	0726170858	
06	John Mwangi Waithaka		11482146	0727872389	
07	George Kairu Kabue	1/2452	0713859	0722 614 257	
08	Josephine Nyambura Kairu	1/2688	0716 697 164	0722 22 35 26	
09	Robert Njoroge Mwaura	~~782~~ 1/792	5782098	0786 373 659	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ---------29---------/---------11---------/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
10	Simon Wacera Karanja		24070450	0705 96 12 96	
11	Joseph Mbaria Mburaru	1/1388	25802513	0718 663 750	
12	Samwel Kimani Njoki	~~1/2357~~ 1/2257	22280023 ~~0708892042~~	0708 892 042	
13	Dominic Kimani Karuga		13533508	0723 410 647	
14	Martin Murithi Kimotho	1/2468	7075949	0722 789 989	
15	Samwel Mbagua Waigongo	1/1383	22340451	0724 115 608	
16	James Muangi Kamau	1/792	1340229	0723 854535	
17	John Njoroge Kimani	1/5131	13535726	0728 822 201	
18	Amos Kibe Githuka	1/1357	26531880	0798 312737	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: 20/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
19	Amos Kibe Waigongo	1/1383	22104793	0728954511	
20	Simon Karanja Githuka	1/1357	22261506	0701065924	
21	Wilson Njugana Waigongo	1/1383	28810306	0727962625	
22	John Nganga Njenga	1/2641	11389857	0720577837	
23	Ibrahim Maina Thiga	1/136878	29247400	0712553747	
24	Paul Kihingo Waigongo	1/1383		0729374450	
25	David Wango Waigongo	1/1383		0723655300	
26	Stanley Chege Karanja		25738272	0745362709	
27	Simon Gitau Mwaura	1/1384	31007283	0759008468	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.2 ATTENDANCE SHEET DATE: 20/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
28	Jusphat Mbugua Mwangi	H2/1/1422	22708101	0759351155	
29	Geoffrey Mbugua Waigongo		11802998	0727849254	
30	Stephen Maina Karanja	1/1905	12941930	0728622129	
31	Peter Kinuthia Kiarie	1/1402	5783027	0721671681	
32	Jusphat Njoroge Kapaki	1/2640	2570997	0723816260	
33	Zadayo Mangara Thiga	1/1368	25752337	0715002484	
34	Samuel Njeru Karanja	1/1907	11802969	0700929535	
35	Peter waigongo Githumiri	1/1383	6850070	0727210469	
36	Elijah Nganga Thandi	1/1845	21526681	0742439488	Nganga

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING: NO.2 ATTENDANCE SHEET DATE: 29/11/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
37	Samwel Kariuki Waigongo	1/1385	22739160	0723254809	
38	Paul Njoroge Ndenta		3114219	0714502646	
39	Gladys - Waithira Thandi	1/1845	5783298	0742439468	G waithira
40	Stephen Kiarie Thandi	1/1845	24613340	0742 43 9468	
41	Joseph Njoroge Thandi	1/1845	24713654	0742439468	
42	Wanjiru Ngang'a	1/1380		0718008540	Wanjiru W
43	Fredrick Kinganjai Mangi	1/1844	1189750	0710219909	Fredrick Kinganjai mange
44	Martha Gakuhi Thiga	1/1378	9860579	0700608794	Martha
45	Jane N. Kariuki	1/1329	10849707	0702022725	

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ---------- 29 / 11 ----------/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
46	Wariencé Mukaná		8575306	0722855793	
47	Magdeline Wamoro Kararija	1/1908	13535628	0728428053	magdaline
48	Joyce Wambui Kihara	1/1594	3072912	0711309399	JOYCE
49	Eunice Njoki Ndegwa	1/2257	3080934	0723914765	
50	Hannah Mathoni Njeru	~~H3150~~ 1/H3 1/3150	11882195	0716927696	H M
51	Stephen Nyoro Njoroge	1/1382	7279942	0722394265	
52	John Njeru Ndungu	1/3356	7279924	0716293307	
53	Samwel, Mwaura Mwangi	1/2267	9370789	0797543459	
54	Muthanna Njoroge	1/1381	~~0721329287~~ 4309613	0721329287	Muthoma

ATHI WATER WORKS
Accelerating Access to Water and Sanitation

KINALE DAM WATER SUPPLY PROJECT

RESETTLEMENT ACTION PLAN

MEETING:---------- NO.2 ---------- ATTENDANCE SHEET DATE: ----------29----/----11----/2020

S/No	NAME	PARCEL No.	ID No.	CONTACT	SIGN
55	Zadayo Mdngara Njoroge	1/792	29556734	0708 222 510	
56	John Mwangi Mburu	1/2093	12941987	0717784157	
-57	Isaiah Njoroge Mbugua		0481167	0720296419	
58.	VENNA W. LABUNJA.	AWADA.	29278580	0704711293	

APPENDIX III: ASSET REGISTER

SN	MASH AREA N0.	CLAIMANT	CATEGORY OF PAP	LAND VALUE	IMPROVEMENTS VALUE	LAND & IMPROVEMENTS	15% STATUTORY	LOSS OF INCOME	TOTAL VALUE
1	Escarpment/Kinale Block I/2464	Elijah Nganga Thandi	Farmer	0.00	10,570.00	10,570.00	1,585.50	0.00	12,155.50
2	Escarpment/Kinale Block I/2464	Fredrick Mbugua Thandi	Farmer	0.00	60,960.00	60,960.00	9,144.00	0.00	70,104.00
3	Escarpment/Kinale Block I/2464	Joseph Njoroge Thandi	Farmer	0.00	7,530.00	7,530.00	1,129.50	0.00	8,659.50
4	Escarpment/Kinale Block I/2464	Stephen Kiarie Thandi	Farmer	0.00	10,600.00	10,600.00	1,590.00	0.00	12,190.00
5	Escarpment/Kinale Block I/2464	Ruth Ndiko Thandi	Farmer	0.00	8,365.00	8,365.00	1,254.75	0.00	9,619.75
6	Escarpment/Kinale Block I/2464	Gladys waithera Thande	Farmer	0.00	16,080.00	16,080.00	2,412.00	0.00	18,492.00
7	Escarpment/Kinale Block I/2464	Patrick Njoroge Ngugi	Farmer	0.00	22,400.00	22,400.00	3,360.00	0.00	25,760.00
8	Escarpment/Kinale Block I/2464	Robert Njoroge Mwaura	Farmer	0.00	148,280.00	148,280.00	22,242.00	0.00	170,522.00
9	Escarpment/Kinale Block I/2464	James Mwangi Kamau	Farmer	0.00	103,300.00	103,300.00	15,495.00	0.00	118,795.00
10	Escarpment/Kinale Block I/2464	Zandayo MungaraNjoroge	Farmer	0.00	45,000.00	45,000.00	6,750.00	0.00	51,750.00
11	Escarpment/Kinale Block I/2464	Paul Mutungu Mburu	Farmer	0.00	11,120.00	11,120.00	1,668.00	0.00	12,788.00
12	Escarpment/Kinale Block I/2464	Simon Ndungu Mburu	Farmer	0.00	163,900.00	163,900.00	24,585.00	0.00	188,485.00
13	Escarpment/Kinale Block I/2464	Joyce Wambui Kihara	Farmer	0.00	98,800.00	98,800.00	14,820.00	0.00	113,620.00
14	Escarpment/Kinale Block I/2464	George Kairu Kabue	Farmer	0.00	330,940.00	330,940.00	49,641.00	0.00	380,581.00
15	Escarpment/Kinale Block I/2464	Muthama Njoroge	Farmer	0.00	584,460.00	584,460.00	87,669.00	0.00	672,129.00
16	Escarpment/Kinale Block I/2464	John Mwangi Waithaka	Farmer	0.00	27,185.00	27,185.00	4,077.75	0.00	31,262.75
17	Conservation 2354	Moses Ngugi Gichui	Tenant Farmer	0.00	449,596.00	449,596.00	67,439.40	0.00	517,035.40
18	Conservation 2354	Peter Nganga Njuguna	Tenant Farmer	0.00	394,300.00	394,300.00	59,145.00	0.00	453,445.00
19	Conservation 2353	Moses Ngugi Gichui	Tenant Farmer	0.00	54,240.00	54,240.00	8,136.00	0.00	62,376.00
20	Conservation 2353	Peter Nganga Njuguna	Tenant Farmer	0.00	28,600.00	28,600.00	4,290.00	0.00	32,890.00
21	Escarpment/Kinale Block I/2465	Stephen Nyoro Muthama	Farmer	0.00	211,450.00	211,450.00	31,717.50	0.00	243,167.50
22	Escarpment/Kinale Block I/2465	Jane Wanjiru Muthama	Farmer	0.00	215,850.00	215,850.00	32,377.50	0.00	248,227.50
23	Escarpment/Kinale Block I/2465	Samuel Nganga Muthama	Farmer	0.00	408,330.00	408,330.00	61,249.50	0.00	469,579.50
24	Escarpment/Kinale Block I/2465	Fredrick Kinyanjui Munge	Farmer	0.00	87,100.00	87,100.00	13,065.00	0.00	100,165.00
25	Escarpment/Kinale Block I/2465	James Mwangi Kamau	Farmer	0.00	64,400.00	64,400.00	9,660.00	0.00	74,060.00
26	Escarpment/Kinale Block I/2466	Peter Waigongo Gikumiri	Farmer	0.00	93,760.00	93,760.00	14,064.00	0.00	107,824.00
27	Escarpment/Kinale Block I/2466	James Mwangi Kamau	Farmer	0.00	3,285,200.00	3,285,200.00	492,780.00	0.00	3,777,980.00
28	Escarpment/Kinale Block I/2466	Felister Warii Muthoni	Farmer	0.00	11,640.00	11,640.00	1,746.00	0.00	13,386.00
29	Escarpment/Kinale Block I/2466	Amos Kibe Waigongo	Farmer	0.00	60,680.00	60,680.00	9,102.00	0.00	69,782.00
30	Escarpment/Kinale Block I/2466	David Wango Waigongo	Farmer	0.00	478,050.00	478,050.00	71,707.50	0.00	549,757.50
31	Escarpment/Kinale Block I/2466	George Kairu Kabue	Farmer	0.00	544,800.00	544,800.00	81,720.00	0.00	626,520.00
32	Escarpment/Kinale Block I/2466	Martha Wamaitha Nganga	Farmer	0.00	21,130.00	21,130.00	3,169.50	0.00	24,299.50
33	Escarpment/Kinale Block I/2466	Peter Nganga Wanjiru	Farmer	0.00	24,480.00	24,480.00	3,672.00	0.00	28,152.00
34	Escarpment/Kinale Block I/2466	Mary Wanjiku Muthama	Farmer	0.00	209,590.00	209,590.00	31,438.50	0.00	241,028.50
35	Escarpment/Kinale Block I/2466	Stephen Nyoro Njoroge	Farmer	0.00	155,030.00	155,030.00	23,254.50	0.00	178,284.50
36	Escarpment/Kinale Block I/2466	Jacinta Waithira Kimani	Farmer	0.00	59,380.00	59,380.00	8,907.00	0.00	68,287.00
37	Escarpment/Kinale Block I/2467	Joseph Muturi Njenga	Farmer	0.00	125,100.00	125,100.00	18,765.00	0.00	143,865.00
38	Escarpment/Kinale Block I/2467	John Nganga Njenga	Farmer	0.00	38,560.00	38,560.00	5,784.00	0.00	44,344.00
39	Escarpment/Kinale Block I/2467	Paul Njoroge Gathitu	Farmer	0.00	65,510.00	65,510.00	9,826.50	0.00	75,336.50

SN	MASH AREA N0.	CLAIMANT	CATEGORY OF PAP	LAND VALUE	IMPROVEMENTS VALUE	LAND & IMPROVEMENTS	15% STATUTORY	LOSS OF INCOME	TOTAL VALUE
40	Escarpment/Kinale Block I/2467	Eunice Njoki Kimani	Farmer	0.00	237,795.00	237,795.00	35,669.25	0.00	273,464.25
41	Escarpment/Kinale Block I/2467	Paul Ndungu Kinyanjui	Farmer	0.00	121,600.00	121,600.00	18,240.00	0.00	139,840.00
42	Escarpment/Kinale Block I/2467	John Njoroge Kimani	Farmer	0.00	365,650.00	365,650.00	54,847.50	0.00	420,497.50
43	Escarpment/Kinale Block I/2467	Peter Wandaire Githuka	Farmer	0.00	42,250.00	42,250.00	6,337.50	0.00	48,587.50
44	Escarpment/Kinale Block I/2467	Amos Kibe Githuka	Farmer	0.00	20,500.00	20,500.00	3,075.00	0.00	23,575.00
45	Escarpment/Kinale Block I/2467	Simon Karanja Githuka	Farmer	0.00	36,850.00	36,850.00	5,527.50	0.00	42,377.50
46	Escarpment/Kinale Block I/2467	Samuel Njoroge Njuguna	Farmer	0.00	23,680.00	23,680.00	3,552.00	0.00	27,232.00
47	Escarpment/Kinale Block I/2467	Geofrey Kimani Kinyanjui	Farmer	0.00	213,350.00	213,350.00	32,002.50	0.00	245,352.50
48	Escarpment/Kinale Block I/2467	Peter Wandaire Githuka	Farmer	0.00	177,770.00	177,770.00	26,665.50	0.00	204,435.50
49	Escarpment/Kinale Block I/2467	Grace Mukue	Tenant Farmer	0.00	23,810.00	23,810.00	3,571.50	0.00	27,381.50
50	Escarpment/Kinale Block I/2467	John Muchugi Wang'ombe	Tenant Farmer	0.00	128,380.00	128,380.00	19,257.00	0.00	147,637.00
51	Escarpment/Kinale Block I/2467	Peter Ndungu Kimani	Farmer	0.00	50,000.00	50,000.00	7,500.00	0.00	57,500.00
		Zipporah Wanjiru Chege (Decea	Farmer	0.00					
52	Escarpment/Kinale Block I/2467	Mary Wambui Ndungu	Farmer	0.00	469,000.00	469,000.00	70,350.00	0.00	539,350.00
53	Escarpment/Kinale Block I/2467	Joshua Njoroge Kabaki	Farmer	0.00	53,470.00	53,470.00	8,020.50	0.00	61,490.50
54	Escarpment/Kinale Block I/2467	Joseph Kimani Kiruka	Farmer	0.00	26,000.00	26,000.00	3,900.00	0.00	29,900.00
55	Escarpment/Kinale Block I/2467	Stephen Maina Karanja	Farmer	0.00	171,020.00	171,020.00	25,653.00	0.00	196,673.00
56	Escarpment/Kinale Block I/2467	Silas Kanyango Mwangi	Tenant Farmer	0.00	19,200.00	19,200.00	2,880.00	0.00	22,080.00
57	Escarpment/Kinale Block I/2467	James Kibikwa Njeru	Farmer	0.00	135,945.00	135,945.00	20,391.75	0.00	156,336.75
58	Escarpment/Kinale Block I/2467	0	Farmer	0.00	15,800.00	15,800.00	2,370.00	0.00	18,170.00
59	Escarpment/Kinale Block I/2467	Eunice Waithera Mwangi	Farmer	0.00	506,310.00	506,310.00	75,946.50	0.00	582,256.50
60	Escarpment/Kinale Block I/2467	Josephat Mbugua Mwangi	Farmer	0.00	74,300.00	74,300.00	11,145.00	0.00	85,445.00
61	Escarpment/Kinale Block I/2467	Boniface G. Kamotho	Farmer	0.00	314,600.00	314,600.00	47,190.00	0.00	361,790.00
62	Escarpment/Kinale Block I/2467	Joseph Njoroge Mwangi	Farmer	0.00	29,000.00	29,000.00	4,350.00	0.00	33,350.00
63	Escarpment/Kinale Block I/2468	Magdalene Wanoro Karanja	Farmer	0.00	40,280.00	40,280.00	6,042.00	0.00	46,322.00
64	Escarpment/Kinale Block I/2468	Samuel Njeru Karanja	Farmer	0.00	127,220.00	127,220.00	19,083.00	0.00	146,303.00
65	Escarpment/Kinale Block I/2468	Peter Kinuthia	Farmer	0.00	958,500.00	958,500.00	143,775.00	0.00	1,102,275.00
66	Escarpment/Kinale Block I/2468	Patrick Nyanjui Muhuhu	Farmer	0.00	16,480.00	16,480.00	2,472.00	0.00	18,952.00
67	Escarpment/Kinale Block I/2468	Ann Wanjiru Kinuthia	Farmer	0.00	36,300.00	36,300.00	5,445.00	0.00	41,745.00
68	Escarpment/Kinale Block I/2468	John Nganga Njenga	Farmer	0.00	85,540.00	85,540.00	12,831.00	0.00	98,371.00
69	Escarpment/Kinale Block I/2468	Samuel Njeru Karanja	Farmer	0.00	8,960.00	8,960.00	1,344.00	0.00	10,304.00
70	Escarpment/Kinale Block I/2468	Jmaes Wakangu Kamondia	Farmer	0.00	534,400.00	534,400.00	80,160.00	0.00	614,560.00
71	Escarpment/Kinale Block I/2468	Joseph Githenji Mungai	Farmer	0.00	256,675.00	256,675.00	38,501.25	0.00	295,176.25
72	Escarpment/Kinale Block I/2468	Martinus Muriithi Kimotho	Farmer	0.00	510,380.00	510,380.00	76,557.00	0.00	586,937.00
73	Escarpment/Kinale Block I/2468	Isaac Gachukia Gikonyo	Farmer	0.00	40,400.00	40,400.00	6,060.00	0.00	46,460.00
74	Escarpment/Kinale Block I/2468	Simon Njuguna Wanjiru	Farmer	0.00	114,680.00	114,680.00	17,202.00	0.00	131,882.00
75	Escarpment/Kinale Block I/2468	John Mwangi Mutungu	Farmer	0.00	113,160.00	113,160.00	16,974.00	0.00	130,134.00
76	Escarpment/Kinale Block I/2468	Patrick Nyanjui Muhuhu	Farmer	0.00	138,475.00	138,475.00	20,771.25	0.00	159,246.25
77	Escarpment/Kinale Block I/2468	Gerald Kibunja Njogu	Farmer	0.00	35,250.00	35,250.00	5,287.50	0.00	40,537.50
78	Escarpment/Kinale Block I/2468	Francis Githuri Muhuhu	Farmer	0.00	17,390.00	17,390.00	2,608.50	0.00	19,998.50
79	Escarpment/Kinale Block I/2468	Peter Kimani Mwangi	Farmer	0.00	153,600.00	153,600.00	23,040.00	0.00	176,640.00
80	Escarpment/Kinale Block I/2468	Isaac Gachukia Gikonyo	Farmer	0.00	24,420.00	24,420.00	3,663.00	0.00	28,083.00
					15,204,656.00	**15,204,656.00**	**2,280,698.40**	**0.00**	**17,485,354.40**

APPENDIX IV: GRIEVANCE REGISTRATION FORM

Resettlement Action Plan Public Grievance Registration Form

RAP Reference No.	
Full Name	
Contact Information Please mark how you wish to be contacted (mail, telephone, e-mail)	Address: ---------- ---------- ---------- Telephone:-_____ Email----------
Preferred Language for Communication (Please mark how you wish to be contacted)	English Kiswahili
National Identity Number	
Description of complain or Grievance:	
What would you like see happen to solve the problem?	
Official use Receipt date: Nature of grievance: Action to be taken	

Signature of aggrieved party:

Date:

APPENDIX V: SAMPLE GRIEVANCE AND RESOLUTION FORM

Name (Filer of Complaint): _____

ID Number (PAPs ID number): _____
Contact Information (mobile phone): _____
Nature of Grievance or Complaint:
_____
_____

Date **Individuals Contacted** **Summary of Discussion**
_____ _____ _____

Signature_____ Date: _____

Signed (Filer of Complaint): _____

Name of Person Filing Complaint (if different from Filer): _____

Review/Resolution
Date of Conciliation Session: _____
Was Filer Present? Yes_____ No_____
Was field verification of complaint conducted? Yes_____ No_____
Findings of field investigation:
_____
_____

Summary of Conciliation Session
Discussion: _____
_____

Issues_____

Was agreement reached on the issues? Yes__ No_____
If agreement was reached, detail the agreement below:
If agreement was not reached, specify the points of disagreement below:
_____

Signed (Conciliator): _____ Signed (Filer): _____

Signed: _____
Independent Observer

Date: _____

APPENDIX VI: SAMPLE QUESTIONNAIRE

QUESTIONNAIRE

RESETTLEMENT ACTION PLAN FOR PROPOSED KINALE DAM WATER SUPPLY PROJECT

PROJECT AFFECTED HOUSEHOLD INTERVIEW

Introduction

AWWDA intends to undertake a Resettlement Action Plan (RAP) for the proposed water supply project. The RAP is being conducted to determine compensation of Project Affected Persons (PAPs). We therefore request you to provide the following information to assist in decision making on this project. Please fill in the following information correctly:

Questionnaire Number	

Name of Property Owner			ID No.
Sub- county		Division	
Location		Sub-location	
Date			

1.0 Socio-economic

House-hold head	Gender	Age	Number of Dependants	Disability	Health status	Marital Status	Education
Child Adult	Male Female	How old is...[Name] in Years		Disabled Normal	Sick Aged	Married Widowed Divorced Separated Single	What is the highest Level of education of respondent? 1. Primary 2. Secondary 3. Post-Secondary 4. Never attended

What is the main source of water?	What is the distance to the main water source?
1. River 2. Springs 3. Shallow well 4. Borehole 5. Piped water 6. Other	1. < 1 km 2. 1.1 – 3 km 3. 3.1 – 5 km 4. Over 5 km

2.0 Employment/ Source of Income

What the person does for a living	Other Sources of Incomes for the past one year
1. Farming 2. Livestock Rearing 3. Business 4. Formal employment 5. Casual employment	1. Farming 2. Business 3. Employment 4. Remittance 5. Others (Specify)

3.0 Assets

Land				
Size of Land Affected (m)	**Ownership**	**Proof of ownership**	**Land Use**	**Estimated value per acre**
To be filled by the survey	1. Leasehold 2. Freehold 3. Trust land 4. Squatter 5. Other(specify)	1. Title deed 2. Allotment letter 3. No proof	1. Arable 2. Livestock 3. Sanctuary 4. Other Uses (specify)	*To be filled by the valuer*

		4. Other (specify)		

Buildings (Name)	Year of construction	Materials	Condition of the Building	Estimated cost
		1. Grass thatched 2. Permanent 3. Semi-Permanent	1. Good 2. Fair 3. Poor	

Other Affected Structures 1. Fence 2. Well/Boreholes 3. Others (Specify)	Description (length or depth)	Construction material	Estimated Cost

Type of Crop	Area Affected	Maturity stage	Estimated Value

4.0 Public utilities

Is the Person Close to the following Social Structures	Distance	Description
1. Primary School 2. Secondary School 3. H/Centre 4. Road 5. Water Point 6. Historical Sites 7. Others (Specify)		

5.0 Trees

Type	Name	Number	size	Estimated cost
Indigenous				
Exotic				
Fruit bearing tree				
Timber trees				
Perennial crops				
Other(specify)				