Strategic Environmental Assessment of the Proposed Red Coral Development in Limuru, Kiambu County

Final SEA Study Report

10442K-SEA-H-0001

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Rev. 1

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Declarations

This **Final Strategic Environmental Assessment Study Report** for the **Proposed Red Coral Development in Limuru, Kiambu County** is prepared and submitted, on behalf of **Howard Humphreys (East Africa) Ltd** by:

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Acronyms and Abbreviations

EA:	Environmental Audit
EIA:	Environmental Impact Assessment
EMCA:	Environmental Management and Coordination Act
KeNHA:	Kenya National Highways Authority
KP:	Kenya Power
KV:	Kilo Volts
LIWASECO:	Limuru Water and Sewerage Company
LT:	Long Term
MVA:	Mega Volt Amperes
NEMA:	National Environment Management Authority
NGO's:	Non-Governmental Organizations
OSHA:	Occupational Safety and Health Act
PAPs:	Potentially Affected Persons
PPE:	Personal Protective Equipment
RCPL:	Red Coral Properties Limited
SEA:	Strategic Environmental Assessment
ST:	Short Term
WRMA:	Water Resource Management Authority

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Non-Technical Summary

The Proponent

The Plan Proponent – Red Coral Properties Limited (RCPL) - is in possession of a 387-acre parcel of land on the outskirts of Limuru town and is desirous of developing the land to meet the growing demand for housing, commercial and light industrial developments away –yet proximal to the Nairobi City Centre. The availability of large parcels of land in Kiambu County has enabled development of large-scale housing schemes and mixed use developments such as Thika Greens, Buffalo Springs and Bahati Ridge, among others. Others such as Tatu City, Albizzia Downs Estate and Northlands are still in their planning or development stages.

Plan background

The aim of the development is to provide a quality environment which affords pleasant, clean and safe mixed communities for living, work and play away from the Capital City. Execution of the plan will contribute in meeting part of the housing demand in the Nairobi Metropolitan region as well as provide choices and options for existing residents wishing to live in a high quality environment provided with a wide range of amenities and easy access to services and employment opportunities.

Need for SEA

Strategic environmental assessment (SEA) refers to a family of analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programs (PPPs) and evaluate the inter linkages with economic and social considerations (OECD, 2006). It is used to facilitate integration of environmental considerations, along with social and economic aspects, into strategic decision making at all stages. SEA adds particular value by analyzing PPPs at an early preparatory stage in their formulation, setting the context and framework for EIAs of subsequent projects. It thus complements the application of EIA, leaving this process to focus on issues of how rather than whether or where a development proposal should go ahead.

The SEA methodology

The SEA was carried out in line with the provisions of the Environmental Management and Coordination Act, 1999, the Environmental (Impact Assessment and Audit) Regulations 2003, the National Guidelines for Strategic Environmental Assessment in Kenya, 2012, as well as international guidelines on environmental and social impact management. Scoping Studies were first carried out to identify the key stakeholders, identify the main issues and concerns and to select the SEA objectives. Thereafter, the SEA study was carried out entailing the collection of baseline information, stakeholder engagement, identification and prediction of significant environmental and social impacts among other activities.

Plan description

The proposed master plan for the development is comprised of various forms of use mainly including: residential (super low, low, medium and high density residential zones); Light industrial (mainly warehousing); and commercial (offices, retail and iconic site). Other forms of use include educational, water treatment plants, power substation, waste transfer site, dedicated park/fields, green and open spaces, and trunk roads.

The proposed plan will have varying effects/influence on the Nairobi Metropolitan Region due to its proximity to the City Centre and strategic location along the gateway to the North-Rift and Western Regions of Kenya. However the plan will mainly impact on neighboring towns such as Limuru and Kikuyu, and other trading centers such as Rironi and Tigoni catalyzing commerce, infrastructure development and economic growth of these areas

Environmental baselines

Baseline information on the plan area was collected to aid the identification of potential environmental and social impacts. Information on hydrology/hydrogeology of the area, geology/soils, biodiversity, ambient air and noise conditions and land use was collected. The information was collected through site investigations, desktop searches, and consultations. The site is found on the lower highland zone of Kiambu County's topographical regions at an elevation of between 2230 - 2304m above sea level. It is covered by soils which are well drained, extremely deep, dusky red to dark reddish brown friable clay, with an acid humic topsoil (humic NITISOLS). There are no surface water bodies within the site or general area and ground water is heavily relied upon to meet the water requirements of developments in the area. A large portion of the site is covered by grasses such as *Sporobolus pyramidalis*, *Cynodon dactylon*, *Cypperus sp* and *Pennisetum sp* while other portions are covered by *Grevillea robusta* and *Acacia mearnsii* tree stands. There are no large fauna except free ranging cattle, while others found include rodents, birds and herperto-fauna such as chameleons, frogs, and lizards.

Area/sectors to be affected by the proposed plans

The proposed plan will have varying effects/influence on the Nairobi Metropolitan Region due to its proximity to the City Centre and strategic location along the gateway to the North-Rift and Western Regions of Kenya. However the plan will mainly impact on neighboring towns such as Limuru and Kikuyu, and other trading centers such as Rironi and Tigoni catalyzing commerce, infrastructure development and economic growth of these areas. These areas have traditionally been agricultural-based economies but have seen an up-surge of real estates as housing, trading centers and shopping malls replace agricultural land. This conversion is mainly in response to the growing demand created by an economically thriving capital city.

Review of the policy, legal and administrative framework

A review of the relevant legislation, policies and regulations was carried out in order to align the plans with these provisions. Thus, the Environmental Management and Coordination Act, 1999 with all its subsidiary legislation and other sectoral laws were reviewed to establish their bearing on the proposed plans. The guidelines for Strategic Environmental Assessment in Kenya were also reviewed and were critical in defining the SEA activities necessary for a concise but comprehensive study. Legislation reviewed included:

- The Constitution of Kenya;
- Environmental Management and Coordination Act 1999
- Environmental (Impact Assessment and Audit) Regulations, 2003
- Environmental Management and Co-ordination (Water Quality; Waste Management; Noise and Excessive Vibration Pollution; Fossil Fuel Emission Control; Air Quality; Wetlands, River Banks, Lake Shores and Sea Shore Management; Conservation of Biological Diversity; and Controlled Substances) Regulations;
- The Water Act 2002;

- The Water resource management rules 2007;
- The Public Health Act (Cap 242);
- The Wildlife Conservation and Management Act, 2013;
- The Physical Planning Act, 1999;
- Employment Act 2007;
- Occupational Safety and Health Act, (OSHA) 2007;
- The Factories and Other Places of Work (Noise Prevention and Control; Fire Risk Reduction) Rules;
- The Penal Code (Cap. 63)
- Traffic Act Cap 403
- Energy Act, 2006
- The Civil Aviation Act, Cap 394
- The Land Act, No. 6 of 2012
- Land Registration Act No. 3 of 2012
- International Convention on Biological Diversity (1992)
- The World Heritage Convention (1972)
- The Ramsar Convention 1971
- The United Nations Framework Convention on Climate Change

Plan options

The planning process entailed the identification and evaluation of various alternatives including:

- Structure plan options: where different structure plans with varying space allocations were considered;
- Water and power supply options: various sources of water and power for the development were considered in terms of sufficiency, local impacts and costs;
- Waste management options: different solid and effluent disposal options were considered and analyzed in terms of their environmental impacts and costs.

Stakeholder engagement

The stakeholder engagement was carried out through an elaborate process spanning over a year. At the early stages of the planning process, stakeholder consultations were carried out with various authorities to define the development limits and controls. Later, consultations were carried out to inform the stakeholders about the proposed plan and provide opportunities for influencing/amending the plans; collect stakeholders' views on the proposed plan including potential positive/negative impacts stakeholders associate with the proposed plan and Stakeholders' preferred development; and to get local knowledge on any sensitive areas within the plan scope (physical/environmental, cultural or proposed facilities).

The stakeholder analysis conducted identified community and institutional stakeholders who included: The neighboring residents and institutions; The local authority i.e. Kiambu County Government; Rironi Self Help Water Project; County Administration including the Assistant County Commissioner, area chief and sub-chiefs; Limuru Water and Sewerage Company (LIWASECO); Kenya Power; Water Resource Management Authority (WRMA); Kenya National Highways Authority (KeNHA); Kenya Rural Roads Authority (KeRRA); Kenya Railways; and The National Environment Management Authority (NEMA) – Kiambu County.

A workshop for the community stakeholders and another for the institutional stakeholders was held in which the plans were presented and discussions initiated to obtain concerns, alternative views and ideas. The plan was viewed as acceptable and worthwhile by most of the community stakeholders with the general

perception that the development would lead to creation of employment and business opportunities, and growth of infrastructure and other services/amenities in the area. The concerns raised however were on whether the plans included an educational facility to complement the existing facility in the area, whether a medical centre would be included, and on the fate of the existing community water supply infrastructure on site. Other concerns were on potential nuisances/pollution from the waste emanating from the development, and on the types of industries that are envisaged in the development due their pollution potential. The institutional stakeholder concerns were on issues such as existence and adequacy of a discharge control plan for the development; provision of adequate road reserves, acceleration/deceleration lanes and suitable junction designs for access roads to manage traffic; and the waste management strategy for the development.

Prediction and evaluation of impacts

Potential impacts of the proposed plans were identified against themes such as: traffic and transport; water resources; energy resources; noise and vibrations; air quality; waste; geology and soils; biodiversity and nature conservation; health and safety; and sustainable procurement, economy and employment. Many of the identified short term impacts are characteristic of any construction site while the long term impacts were also typical for a development of the proposed nature. It is expected that with adequate measures in construction/operation-phase environmental management plans, these impacts can be mitigated effectively.

Traffic and transport

The likely impacts on traffic and transport include: an increase in traffic along the A 104 Nairobi – Nakuru Road, C62 – Limuru Road, and the D378 Ngecha - Chunga Mali Road; Requirements for additional maintenance of these roads due to damage caused by Heavy Goods Vehicles (HGV) especially during construction; and higher air and noise emissions adversely affecting the local air quality and ambient noise levels. Measures proposed to counter these impacts include the development and implementation of a Traffic Management plan to ensure safety, prevention of traffic snarl ups and congestion; observation of speed and loading limits; and proper maintenance of construction vehicles. The plans include a proposal to have a railway station on the eastern side of the development which when operational, will lead to reduced vehicular traffic to/from the RedCoral Development.

Water resources

Water resources will be impacted from a higher demand for water both for construction purposes and during operations. The area is heavily reliant on groundwater supply and much of the water is expected to be supplied from boreholes that will be drilled at the site. Projected water demand when the development is complete is at 1,630m^3/day and this may have an adverse effect on the local ground water resources. Waste water from the construction site/activities, lack of adequate spill control measures during construction and percolation of contaminated water from lagoons also has potential to pollute soil and ground water resources. To mitigate these adverse impacts, conservative use of the available water, and protection of water sources from pollution shall be done. Conservation measures shall include: awareness creation; measures to reduce, re-use and recover water during the construction process; institution of spill control measures for potential pollutants; rainwater harvesting; treatment and recycling of effluent; and use of low-volume fixtures in the households.

Energy resources

There will be a higher demand for grid energy and fossil fuel resources both during construction and operation phases of the development. This will be in the running of construction vehicles and machinery and for lighting and powering equipment in residential, commercial and industrial establishments. To mitigate adverse impacts on energy resources, there will be careful selection of plant and machinery with

minimal energy requirements during construction; proper fleet management; careful selection of electrical appliances; utilization of solar and wind energy; and energy use monitoring.

Soil and geology
The soil and geology of the site will be affected through potential depletion of the local soil resource from excavation and carting away of spoil material; degradation from compaction and soil sealing leading to soil erosion; and contamination from spillage of hazardous construction chemicals. These impacts shall be mitigated through implementation of spill prevention/control measures; proper management of concrete washout; and erosion control measures.

Biodiversity
The proposed site and the surroundings, due to the existing vegetation cover, forms good habitats and forage grounds for birds, small mammals and herpertofauna. Development will lead to loss of existing vegetation, habitats, forage grounds and local biodiversity. On the other hand, there is an expanse of exotic *Acacia mearnsii* tree stands at the site with invasive tendencies. The clearance of these trees and replacement with indigenous vegetation will enhance local plant diversity possibly also attracting other faunal species. Other vegetation management measures include ensuring minimal clearance of vegetation during construction, and re-vegetation of cleared areas with indigenous vegetation as much as possible.

Air quality
Local air quality will be adversely affected from dust and flue gases emitted during the construction activities. Generators, motor vehicles, incinerators will also emit gases in the operation phase of the development. Management of dust will be done through measures such as the use of dust screens and sprinkling of active construction areas while fumes from vehicles and machinery will be managed through proper maintenance of the vehicles/machinery. There shall also be control of open burning and incineration to reduce emission of gases and particulate matter into the atmosphere.

Noise and vibrations
Noise and vibrations will be generated in the use of vehicles and machinery during construction activities while potential sources of noise and vibrations during the operation phase are likely to be in the use of standby generators in times of grid-power outages. The noise shall be managed through noise-suppression techniques such as in the use of portable hoods to shield compressors, generators and other noisy equipment where possible.

Health and safety
Hazards are likely to increase resulting in a higher exposure of workers, residents and the general public to health and safety risks. These may be in the form of injuries at work, accidents involving construction vehicles and workers/the general public or illnesses from the lack of provision of adequate sanitary facilities. These risks shall be managed through implementation of health and safety plans during construction, adherence to best practices and OSHA, 2007 regulations, and continuous identification of risk areas, development of risk management plans and sensitization programs.

Waste management
Wastes shall be generated during construction and operation phases of the development. These shall range from spoil materials, packaging materials reject materials to organic/inorganic wastes from commercial, industrial and residential developments. These wastes shall require proper handling and disposal to avoid environmental pollution. An integrated solid waste management plan has been incorporated in the Masterplan and shall be implemented during construction and operation phases of the development. The plan is comprised of reduction at source, re-use, recycling, composting, incineration and landfilling. Effluent shall also be treated through package treatment plants and recycled for irrigation, cleaning and flushing.

Sustainable procurement

Extraction of construction materials from resource bases such as quarries, river banks and other sites can lead to degradation of these resource bases if not sustainably managed. The degradation can be mitigated by sourcing of the construction materials from registered and approved sites that have undergone satisfactory environmental impact assessment and are licensed according to the regulations.

Employment and business opportunities

Employment opportunities will be created for both skilled and unskilled workers who include architects, engineers, surveyors, contractors and casual laborers during the construction phase of the development. On the other hand, locally sourced workforce will be employed to support households and commercial establishments in the premises during operation phase of the development

Environmental risk assessment

An environmental risk assessment was done and it was established that the most significant risks were: the potential Failure of construction materials/equipment; Failure to observe health and safety procedures and mechanisms; Failure to observe traffic management principles; Failure of erosion control mechanisms; Failure of spill/leakage control mechanisms; Failure of the waste treatment facilities; Failure of noise control mechanisms; and Failure of air quality control mechanisms. These potential failures were of medium to high significance and control measures ranged from use of quality materials and equipment, proper design and maintenance of erosion/spill control structures, awareness creation to community liaison.

Conclusion

Various plans options were considered and evaluated against environmental indicators. Five Structure Plan Options were considered which had varying densities of residential developments and which in-turn impacted on waste generated, traffic and the water/energy demand for the development. Structure Plan Option 5 was selected for the final plan due to its optimal utilization of land in light for the high demand for housing and the need to have green/natural spaces in the development.

To supply power the development, there was the option to either draw from Rironi, Limuru or Uplands substation. Rironi substation was selected as the most suitable source of power for the development as this would have the least impact in terms of capital cost, as well as environmental disturbance in establishment as compared to tapping from the other substations.

Considering that water supply and sewerage networks do not exist in the plan area, and that Limuru Water and Sewerage Company (LIWASECO) does not have the capacity to supply water to or handle sewerage expected from the proposed development, on-site water supply and sewerage disposal methods were selected. These included water supply from boreholes, rainwater harvesting and recycling of treated effluent.

Various options were also considered for the disposal of solid wastes generated from the development. These included the collection and disposal of waste in a designated landfill or development of an integrated solid waste management strategy for the proposed development. An integrated waste management strategy was arrived upon whereby solid waste would be collected and disposed in an environmentally and socially satisfactory manner using the most economic means available. This would entail collection, sorting recycling, compositing, land filling and incineration

It is concluded that the proposed development will, in principle, make a positive impact on Rironi, Limuru and the Nairobi Metropolitan Region by provision of housing, commercial and industrial space to meet the demands of a rapidly expanding economy. The proposed Red Coral Development will be implemented in phases beginning with development of the light industrial and residential precincts. Thereafter, other

facilities and precincts will be implemented progressively. Before development of each Phase, an Environmental Impact Assessment of the Projects proposed will be carried out to identify and mitigate adverse impacts, while enhancing opportunities.

1. Introduction

The real estate sector in Kenya has been experiencing dramatic growth since the mid-2000s. This has been occasioned by the property market responding to demand created by an expanding middle class with higher disposable income. Kiambu County is one of the main beneficiaries of this growth, the others being Nairobi and Machakos Counties.

Availability of land is one of the major drivers of this growth away from the City. The availability of large parcels of land in Kiambu County has enabled development of large-scale housing schemes and mixed use developments such as Thika Greens, Buffalo Springs and Bahati Ridge, among others. Others such as Tatu City, Albizzia Downs Estate and Northlands are still in their planning or development stages.

The Plan Proponent – Red Coral Properties Limited (RCPL) - is in possession of a 387-acre parcel of land on the outskirts of Limuru town and is desirous of developing the land to meet the growing demand for housing, commercial and light industrial developments away –yet proximal to the Nairobi City Centre.

RCPL has thus commissioned a Strategic Environmental Assessment (SEA) of the proposed development's master plan.

Strategic environmental assessment (SEA) refers to a family of analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programs (PPPs) and evaluate the inter linkages with economic and social considerations (OECD, 2006). It is used to facilitate integration of environmental considerations, along with social and economic aspects, into strategic decision making at all stages. SEA adds particular value by analyzing PPPs at an early preparatory stage in their formulation, setting the context and framework for EIAs of subsequent projects. It thus complements the application of EIA, leaving this process to focus on issues of how rather than whether or where a development proposal should go ahead (Dusik & Xian, 2009).

1.1 Scope of the SEA

The scope of this Strategic Environmental Assessment (SEA) is to identify, describe and assess at a strategic level the environmental and socio-economic opportunities/constraints of implementing the proposed plan, develop practical mitigation measures for addressing the identified limitations as well as the enhancement of opportunities.

The SEA shall ensure that environmental and social considerations are included in the planning, implementation and operation of the Red Coral Development.

The objectives of the SEA are to:

- Identify, describe and assess the likely significant environmental effects of implementing the plan;
- Integrate stakeholders' socio-economic and environmental perspectives into the proposed land use plan;
- Provide information to better integrate environmental considerations into decisions, implementation, and monitoring in order to minimize risks to the plan and risks emanating from the plan;
- Assess alternatives and options that can improve the land use plan; and
- Provide strategic-level recommendations on how to minimize potential negative effects & optimize positive effects.

1.2 Methodology for carrying out the SEA

The SEA was carried out in line with the provisions of the Environmental Management and Coordination Act, 1999, the Environmental (Impact Assessment and Audit) Regulations 2003, the National Guidelines for Strategic Environmental Assessment in Kenya, 2012, as well as international guidelines on environmental and social impact management. The SEA process was organized in two phases: Phase 1 – Scoping, and Phase 2 – the Study.

Phase 1 - Scoping Studies

The Scoping Phase served to establish the focus and content of the SEA and the relevant criteria for assessment. The main activities in this phase included:

- Identification of the key stakeholders;
- Identification of the main issues & concerns (to be further studied during the detailed SEA);
- Selection of the SEA objectives (i.e., the evaluation framework);
- Identification of alternatives (to be assessed during the Analysis Phase of the SEA); and
- Identification of data sources and data gaps, and provide input to the type of methodology to be used during the detailed SEA study.

Phase 2 –the SEA Study

The SEA study entailed the following:-

- Collection of additional baseline information on the physical, biological and socio-cultural environment as identified in the scoping studies. This also entailed an extensive review of the legislative framework with a bearing on the plan and assessment of its compliance with the legislation;
- Stakeholder engagement to deliberate on the proposed plans and identified alternatives
- Analysis of the environmental and socioeconomic baseline data to identify trends, opportunities and constraints in relation to the plans;
- Identification, prediction and quantification of the significant environmental and social impacts of the proposed plan, evaluation of alternatives including their direct, secondary and cumulative effects, and selection of suitable alternatives that enhance environmental and social benefits;
- Identification of measures to enhance opportunities and mitigate adverse impacts

2. Plan Description

2.1 Geographical location

The site is located on the outskirts (approximately 3 kilometers south) of Limuru Town in Kiambu County and is roughly bounded by the following coordinates:

- 1° 8'1.92"S, 36°38'42.12"E
- 1° 8'51.18"S, 36°39'15.51"E
- 1° 9'27.12"S, 36°38'55.37"E
- 1° 9'3.24"S, 36°38'17.92"E
- 1° 8'56.37"S, 36°38'50.29"E

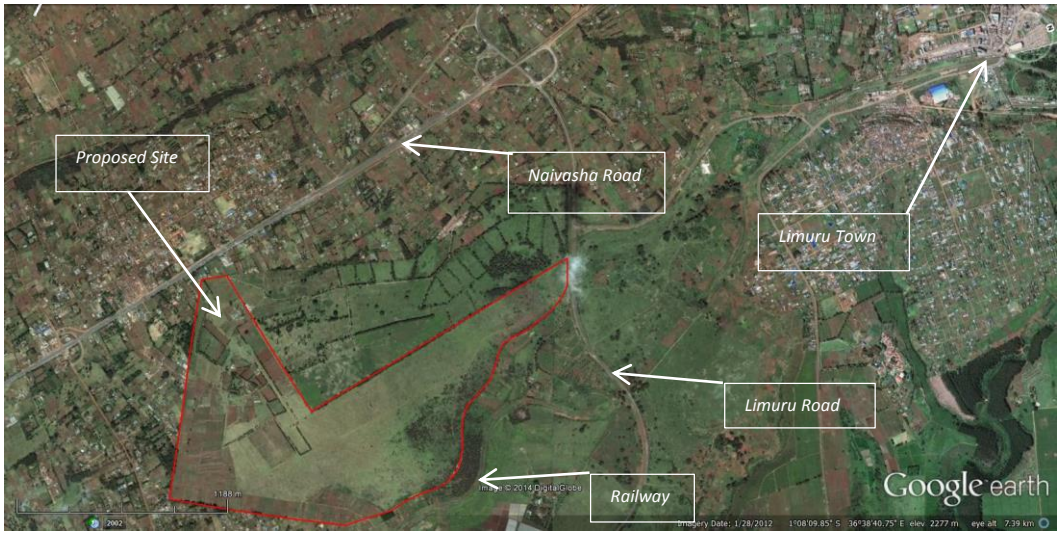


Figure 1: Location of the proposed development

2.2 Plan objectives

The objective of the master plan is to provide a quality environment which affords pleasant, clean and safe mixed communities for living, work and play away from the Capital City. Execution of the plan will contribute in meeting part of the housing demand in the Nairobi Metropolitan region as well as provide choices and options for existing residents wishing to live in a high quality environment provided with a wide range of amenities and easy access to services and employment opportunities.

2.3 Rationale

The master plan has been developed in response to the high demand for decent housing and other supporting uses away from Nairobi City Centre. A recent State of Development Report released by the Kenya Property Developers Association (KPDA) and HassConsult indicated that the housing shortage in Nairobi is acute and deteriorating. The current population of Nairobi stands at 3.5 million and is projected to reach 5million by 2020. The country's aim was to be building 200,000 housing units a year in Nairobi to create a world class middle-income city by 2030. But in 2013, just 15,000 housing units were planned. This signifies a growing shortage in urban middle class housing and failed development goals, based on current trends (HassConsult and Kenya Property Developers Association, 2014)

The site is also proximal to the Nairobi City Centre and this is the trend where such sized parcels of land are available near the City e.g. Bahati Ridge, Tatu City, Thika Greens, Buffalo Springs etc.

2.4 Areas and sectors affected by the proposed plan

The proposed plan will have varying effects/influence on the Nairobi Metropolitan Region due to its proximity to the City Centre and strategic location along the gateway to the North-Rift and Western Regions of Kenya. However the plan will mainly impact on neighboring towns such as Limuru and Kikuyu, and other trading centers such as Rironi and Tigoni catalyzing commerce, infrastructure development and economic growth of these areas.

2.5 Scope of the master plan

The proposed master plan is comprised of the following forms of use:

- Residential: super low, low, medium and high density residential zones;
- Light industrial: mainly warehousing;
- Commercial: Office, retail and iconic site; and
- Others: school, water treatment plants, power substation, waste transfer site, dedicated park/fields, green and open spaces, trunk roads.

The layout in the Technical Appendices Section of this Final SEA Study Report shows the various zones pertaining to the aforementioned activities.

2.5.1 Residential (172.8 acres)

The residential zones take up the bulk of the site and form the primary character of the Red Coral development. The number of residential units per acre varies and is comprised of 4 units (super low density), 8 units (low density) 16 units (medium density) and 40 units (high density) per acre. A summary table of the residential units is provided below.

Table 1: Residential use allocation

Land use	Size (acres)	units / acre	Total Units
Super Low density	15.1	4	61
Low density	64.9	8	519
Medium density	40.3	16	645
High density	52.0	40	2079
TOTAL	**172.3**		**3,304**

2.5.2 Commercial and retail (40.4 acres)

These shall mostly be comprised of office blocks, retail outlets and an Iconic Site/hotel.

Table 2: commercial and retail use allocation

Land use	Size (acres)
Business core/Offices	13.7
Retail	11.3
Iconic Site (Hotel)	13.9
TOTAL	**39**

2.5.3 Light industrial (86.8acres)

Light Industrial is as defined in the Physical Planning Handbook published under the Physical Planning Act, 1996. In the Handbook, a Light Industrial Area is one that caters for types of industries that are compatible with residential areas. Light Industries are labor intensive industries e.g. workshops, laundries, printing, packaging, food processing, light assembly and furniture making establishments (Department of Physical Planning, 2002).

This zone will be occupied by establishments such as warehousing/ logistics developments each set on a five acre parcel of land. A total of 17 industrial plots are proposed in the development.

2.5.4 Other facilities/amenities (88.8 acres)

Other facilities/amenities and services proposed as parts of the development including their spatial coverage are outlined in the table below:

Table 3: Other facilities/amenities allocation

Land use	Size (acres)
Transport Terminal	0.3
Education facilities	8.0
Water tower	10.6
Water treatment plants	
Power sub-station	
Waste Transfer	
Roads	44.6
Public purpose	2.1
Green / Open Space	16.4
Surrender	2.8
Total	**88.8**

2.5.5 Estimated water demand

The proposed plan has an overall water demand of 1,630m^3/day out of which 1,209m^3/day is the potable water demand that will be sourced from boreholes. The non-potable water demand of 421m^3/day will be met from rainwater harvesting and recycling of treated effluent The demand estimates have been derived using the draft land use concept plan prepared for the development.

2.5.6 Wastewater generation and disposal

Estimates of waste water likely to be generated by the proposed development have been made based on expected water consumption rate and internationally recognized sewage factors. The table below summarizes the estimated wastewater quantities based on the projected population and the sewage factors. The wastewater comprises of black water from the toilets and grey water from the bathrooms, laundry and kitchens. The following assumption is also made about the population of the uses:

- Super low residential: 7 people/ unit
- Low density residential: 6 people/ unit
- Medium density residential : 5 people/unit
- High density residential: 4 people/unit
- Offices: 1200 people(total)

- Retail: 960 people (total)
- Iconic Site / Hotel: 100 people (total)
- Transport interchange: 100 people (total)
- School : 500 people (total)

Table 4: Wastewater quantities

Land use	Demand (m3/d)	Sewage factor	Sewage quantity (m3/d)
Super low residential	87	0.8	69
Low density residential	467	0.8	374
Medium density residential	320	0.8	256
High residential	480	0.8	384
Office	30	0.85	26
Retail	24	0.85	20
Iconic Site / Hotel	20	0.85	17
Transport Interchange	3	0.85	2
School	13	0.85	11
Warehousing	175	0.85	148
Recreational/Park	5	0.85	4
Medical	5	0.85	4
Police Post	2	0.85	2
Total	**1,630**		**1,317**

2.5.7 Solid waste generation and disposal

The table below shows the general sources of solid waste expected from the proposed Red Coral Development:-

Table 5: General sources of solid waste

Source	Typical facilities	Types of solid wastes
Residential	Single-family and multifamily dwellings, low, medium and high-rise apartments, etc.	Food wastes, general garbage, ashes, green waste (leaves, grass, etc.), occasionally hazardous waste (e.g. light bulbs, batteries)
Commercial	Stores, restaurants, bars, and offices,	Food wastes, general garbage, ashes, occasionally hazardous wastes
Open areas	Streets, parks, vacant lots, play grounds, recreational areas	Special wastes, rubbish
Industries	Warehouses, offices, vacant lots,	Rubbish, food wastes, occasionally hazardous wastes depending on the type of industries that will operate but unlikely as they are 'light' industries and expected to be more of a logistics park.

In order to estimate the quantity of solid waste generation, typical per capita solid waste generation rates have been applied. The table below shows the computation of solid waste generation for the proposed development.

Table 6: Solid waste generation

Land use	Total Population	Generation rate (kg/h/d)	Quantity (tons/d)
Super low density residential	378	1.6	0.7
Low density residential	3000	1.6	5.0
Medium density residential	3520	1.6	5.1
High density residential	8000	1.6	12.8
Office	1,200	0.7	0.8
Retail	960	0.4	0.4
Iconic Site / Hotel	100	1.3	0.1
Transport Interchange	100	0.2	0.02
School	500	0.3	0.2
Warehousing (assume 0.5t/unit/day)			8.7
Recreational/Park	200		0.1
Medical			1.0
Police Post	20		0.01
Total			**35**

The estimated amount of solid waste to be generated from the site per day is 35 tons.

2.5.8 Power demand and supply

Limuru town and its environs are served from the national grid by a substation at Limuru with others identified for development at Rironi and Red Hill. Recent Kenya Power Distribution Master Plan studies indicate that the customer base for the area has increased rapidly having almost doubled in the last three years and therefore increasing the demand for electricity.

A 66Kv power line traverses the site while 3No 11KV power lines serve the site and its surroundings. The 11Kv power lines are however not adequate to meet the proposed development's power demand.

Power demand for the development is estimated at 40MVA comprising:

- Residential developments: 17.7MVA;
- Industrial warehousing: 17MVA;
- Commercial i.e. Retail office and Iconic Site: 5.15MVA; and
- Others i.e. boreholes, water treatment plants: 0.28MVA

2.6 Alternative options

2.6.1 Structure plan options

Various structure planning options with varying space allocations for developments have been considered. The structure plans mainly differ in the densities of the proposed residential developments.

Other options in the structure plan that have been considered include the type of facilities – whether all or only some should be included or excluded. Facilities that had not been included in the original plans were also considered.

The location of the various facilities was also considered in developing a suitable option.

2.6.2 Power supply options

Options that were considered for supply of power to the site include:

- **Option 1**: To tap a dedicated line from the planned Rironi substation directly to the Red Coral site. This would require a 66KV line from the Rironi Substation to a substation within the site from where other 11KV lines to the various load points would radiate
- **Option 2**: To tap from the existing 2No.11KV lines which feed the KBC communication station and other customers to the west of the site. The lines whose designed load is about 4MVA are currently loaded at 2.4MVA and 2.3MVA, implying that the available load for the site from these lines is 1.6MVA and 1.7MVA respectively. These available supplies would only be used to feed some of the 5acre parcels for the industrial warehousing as the entire industrial warehousing would require about 17MVA.
- **Option 3**: To introduce a substation from the 66kv lines passing near the site. Kenya Power could assess the 66kv lines passing near the site to see if a substation can be located on site to meet the load demand. This option would be considered by Kenya Power while assessing the demand and the possible capacity for the new development.
- **Option 4**: To tap from the 11kv line along Limuru road to the north of the site. The line is designed to carry 4MVA but is loaded to 2.3MVA according to KPLC. This implies that the available power to the site is about 1.7MVA which would only serve a portion of the residential units.

2.6.3 Water supply options

Potential water sources that were considered for the development include:

- Borehole water supply
- Rainwater harvesting
- Recycling of wastewater for use in irrigation and flushing.

2.6.4 Wastewater treatment options

Wastewater treatment options that were considered include:

- Option 1 – Packaged treatment plants with recycling of treated water
- Option 2 – Disposal through Limuru Water and Sewerage Company's (LIWASECO) treatment works (although this may require the prior expansion of the treatment works and pumping of the effluent from the site)

2.6.5 Solid waste disposal options

Various options for solid waste management have been considered one of which is the collection of the waste through a contracted waste handler and disposal in a designated landfill. This entails construction of refuse chambers in every plot or establishment from where solid waste shall be collected by covered trucks in a pre-planned schedule. A transfer station will be located at a specified area on the site to receive the solid waste. This arrangement will allow for sorting and segregation of waste at source. The transfer station will temporarily hold the estimated 35tons of solid waste generated per day by the proposed Red Coral development before it is collected either by Limuru Municipal Council or a private operator for eventual disposal.

The other option considered is an integrated solid waste management plan comprised of on-site waste reduction strategies such as segregation, composting, recycling and re-use at source, and incineration.

2.7 Implementation plan and timelines

The proposed plan will be implemented in phases whereby the first phase covering the southern sections of the property (mainly the industrial precinct) will be implemented first in 2015. In Phase 1, the Client-developed infrastructure and plot sales will be completed in 3 - 4 years. Other phases of the development will be completed in approximately 10 -12 years.

3. Environmental Baseline Conditions

3.1 The Bio-Physical Environment

3.1.1 Topography

Kiambu County in general is divided into four broad topographical regions namely Upper Highland, Upper Midland, Lower Highland and Lower Midland. The Upper Highland is an extension of the Aberdare Ranges, which are steep and form important water catchments for rivers like Bathi and Gatamaiyu.

The upper Midland lies below 1,500 m above sea level. The major features are widespread ridges and volcanic or footbridges.

The lower Highland (of which the site is part of) is found mainly in Limuru and parts of Kikuyu and Githunguri. The area generally has a few ranges with wide spaced parallel ridges. Plateaus and high-level structural plains characterize it. Much of the Red Coral landscape is gently sloping at an elevation of between 2230 - 2304m above sea level.

The lower midland zone is found in parts of Kikuyu (Karai) and Limuru (Ndeiya) Divisions. The soils are dissected erosional plains and vary from well drained, shallow, and dark red to yellowish red, stony loamy sand to imperfectly drained, very deep, dark brown and strongly calcareous soils with sodic clay topsoil.

3.1.2 Geology and Soils

The site is underlain by the Limuru Trachytes geological unit, reaching up to over 200 metres in thickness. These are light-coloured volcanic rocks that are especially suitable for ornamental building stone. It is also covered by soils which are well drained, extremely deep, dusky red to dark reddish brown friable clay, with an acid humic topsoil (humic NITISOLS)

3.1.3 Hydrology and hydrogeology

There are no rivers or other water bodies within or around the project area. Storm water however flows in a south-easterly direction to join Ruaraka and Karura Rivers further downstream.

The Limuru Trachytes geological unit is also the main recharge rock for the Kikuyu Springs Aquifer and the Nairobi Aquifer Suite, due to their outcrop in the watershed and the effects of faults and fractures through which groundwater movement occurs.

The site sits at the tip of the provenance of rivers Ruaraka and Karura. The watershed itself is a raised fault block (horst): the western side of the property is thus elevated on the block, while the eastern boundary runs along the downthrown valley from a second parallel fault zone. Groundwater is therefore bound to occur at deeper levels on the western half of the property than on the eastern side. Correspondingly, boreholes drilled on the western half are likely to suffer from fluid losses during drilling on the one hand, and declining water

levels during the operation period. Decline in water levels during the operation period will be less marked on the eastern boundary and depth to water will be much less.

3.1.4 Climatic conditions

Kiambu County, in the highlands, has a tropical climate, being near the equator. Its rainfall distribution is influenced by altitude because the leeward side of the escarpment receives less rain than the windward side. It has two rainfall seasons, the long rains from March to May and short rains from October to November. The annual average rainfall varies from 845mm in Ruiru, at 1,555m, to 1,373mm at Kereita forest, at 2,438m. Limuru area has a mean maximum temperature of about 20ºC and a mean minimum temperature of about 10ºC.

3.1.5 Flora and fauna

A large portion of the site is covered by grasses such as *Sporobolus pyramidalis*, *Cynodon dactylon*, *Cypperus sp* and *Pennisetum sp* with *Grevillea robusta* trees demarcating various partitions of the land. The north-eastern portion of the land has dense *Acacia mearnsii* tree cover while the southern parts which were previously cultivated are under a mixture of grasses, forbs and shrubs.

No large fauna except free ranging cattle were observed on site. Other resident fauna on site include rodents, various bird species and herperto-fauna such as chameleons, frogs, and lizards.

Plate 1: a, b) open grassland with a *Grevillea sp* tree line; c, d) the *Acacia mearnsii* plantation

3.1.6 Air quality and ambient noise

The Project site environs are predominantly agricultural and residential with a few educational institutions. As such, air and noise pollution levels are low with the only major source of emissions being vehicular

emissions from traffic along the busy Nairobi-Naivasha Road which runs northerly at the western tip of the site.

3.2 Socio-economic environmental setting

3.2.1 Population

According to the Population and Housing Census of 2009, Kiambu County had a population of 1,697,887 while Limuru Division had a population of 104,745 with a density of 667 people per square kilometer.

3.2.2 Land use and Local economy

The combination of good soils, suitable climate, well developed infrastructure and the proximity to the most important capital city in the region has all served to make Kiambu one of the most lucrative farming Counties in the country. Farms range from less than 0.3 ha to large plantations of well over 1,000 ha. Over 90% of the total rural land mass is suitable for farming.

Agricultural activity has a major new competitor in the form of real estate as housing, trading centers and shopping malls offer more reliable dividends to investment than farming. This conversion is mainly in response to the growing demand created by an economically thriving capital city. Horticulture, the growth industry of the last two decades appears capable of out-earning tea and coffee – the traditional cash crops of this region.

Other agricultural activities include dairy farming, and growing of pyrethrum and subsistence crops such as maize, beans and locally consumed vegetables.

The Kiambu County government is shortly releasing its Spatial Plan and it is understood that the subject site is to be zoned for development. This will be in line with the Physical Planning approval for development already obtained by the County Authority.

3.2.3 Mean land holding size

The size of arable land in the County is 1,878.4 Km^2 while that of the non-arable land is 649.7 Km^2. Water masses (dams, ponds and rivers) cover 15.5 Km^2 of the County. The average small-scale land holding size is 0.36 Ha while the large-scale land-holding size is 69.5 Ha.

The small-scale land holdings are mostly found in upper parts of Gatundu North, Gatundu South, Kiambaa, Limuru and Kikuyu constituencies while the large-scale land holdings are usually found in the lower parts of the County especially in Juja constituency and the upper highlands in Limuru and Lari constituencies.

3.2.4 Infrastructure and Access

Road and Rail Network

The County has a good road network. It has a total of 2,033.8 km of roads under bitumen standards, 1,480.2 km under gravel surface and 430.1 km under earth surface. The County also has 131 km of railway line and four railway stations in Ruiru, Thika, Kikuyu and Limuru towns. The rail is not fully utilized in the County and only passenger trains operate between the City of Nairobi and the four stations.

Discussions have been held with Kenya Railways and the possibility of a commuter station adjacent to the site has been raised. Given the already existing development of Kiboko to the east of the site, in addition to

the proposed development, Kenya Railways are considering adopting a railway station adjacent to the subject site into their planning.

Posts and Telecommunications

Mobile communication network coverage in Kiambu County is estimated at 98% while fixed line coverage is poor with only 214 connections in the entire County. This may be attributed to the fact that fixed lines are rapidly becoming obsolete in addition to the high maintenance cost of the fixed line network. There are 19 post offices and 14 sub-post offices which are fairly distributed within the County.

Financial Institutions

There are a total of 17 commercial banks with branches well distributed within the County. In addition, there are eight microfinance institutions, one building society, four village banks and 12 insurance companies. This is may be an indicator of the vibrant economic activities in the County able to sustain the financial sector and making it one of the fastest growing sectors in the County over the last five years.

Education Institutions

There are numerous educational institutions distributed throughout the County comprised of about 1,595 ECD centers (1,063 private and 532 are public), 934 private and public primary schools, while the secondary schools are 303 out of which 227 are public and 76 are Private. The County has one public University, five private universities a number of tertiary colleges.

Energy Access

Firewood is the main fuel used in cooking by 47.3% of the households in the County, while paraffin is the major fuel used in lighting. This poses a great challenge to the realization of 10% forest cover within the County.

98% of all trading centers within the County are connected to the national grid. However, connection to individual homes is low and there is need for up-scaling of the rural electrification programme.

Markets and Urban Centers

The County has a total of 2,517 trading centers with 6,634 registered retail traders and 750 registered wholesale traders. Urban centers in the County include Thika town, Kiambu and Karuri towns in Kiambaa constituency, Kikuyu town in Kabete constituency, Limuru town in Limuru Constituency, Gatundu town in Gatundu South Constituency and Ruiru town in Juja Constituency.

Housing

According to the 2009 Kenya Population and Housing Census, 48.3% of all homes in the County are stone –walled, 4.9% are brick/block, while 4.8% are mud/wood walled. 74.6% of the houses have cemented floors while 87.5% have corrugated iron sheets. A small proportion (0.1%) of the houses have other forms of roofing materials.

The proximity of the County to the city of Nairobi has seen the conversion of large parcels of agricultural land into residential and/or mixed use developments as many of those working in Nairobi opt to reside in the County.

4. Policy, Legal & Administrative Framework

4.1 Introduction

This section sets out the administrative, legal and policy framework relevant to the proposed RedCoral development. It identifies the most pertinent legislation and regulations and standards governing environmental quality, solid and liquid waste management, health and safety, protection of sensitive ecological and cultural areas and land use control at the national and local levels.

It is the Government's policy that the rights of its citizens to clean and health environment are met. In return, every person has a responsibility to protect and manage the environment. In this regard, the Government enacted the Environmental Management and Coordination Act (EMCA) 1999, the Environmental (Impact Assessment and Audit) Regulations, 2003, and a host of other regulations to provide a framework law for the coordinated management of environment. More recently the National Guidelines for Strategic Environmental Assessment in Kenya were launched. These are guidelines that enable integration of environmental considerations into policies, plans and programmes and evaluate the inter-linkages with economic and social considerations

Sections 42 and 43 of the Environmental (Impact Assessment and Audit) Regulations of 2003 describe the national requirements for the conduct of a strategic environmental assessment. While these apply to "public" policies, plans and programmes, NEMA now asks that an SEA is conducted for all policies, plans and programmes that may, among other things:

- Be politically or publicly contentious;
- Have cumulative environmental or social effects;
- Have trans-boundary effects (including those that impact on other municipalities or counties);
- Cause major changes in actions, behaviors or decisions by individuals, businesses, NGOs or government that could lead to, inter alia, major changes in the pattern of settlement, land occupation and/or demographics in an area, or induce changes in society's consumption of energy or other natural resources.

4.2 Applicable Laws and Regulatory Frameworks

4.2.1 The Constitution of Kenya

The Constitution of Kenya (enacted on 27th August 2010) recognizes and protects the right to private property, including land but also removes this protection to allow the Government's interference with private property for public purposes on payment to the dispossessed owner full and prompt compensation. Section 60 of Chapter 5 lays down the principles of land ownership and use as follows:

- 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 ecologically sensitive areas;
- Elimination of gender discrimination in law, customs and practices related to land and property in Kenya; and
- Encouragement of communities to settle land disputes through recognized local community initiative.

The Constitution entrenches the protection of legally acquired land and property rights and any acquisition of rights in land and property, be it voluntary or involuntary, must comply with the law. The recognition of alternative dispute resolution mechanisms is aimed at expediting issues of land rights transfer and supporting economic development. The Constitution grants powers to the State to regulate the use of land. Section 66 (1) provides circumstances in which the State can exercise its powers of eminent domain (the legal right of a government to take private property for public use without the owner's prior consent upon payment of just compensation) to include in the interest of defense, public safety, public order, public morality, public health, or land use planning.

4.2.2 Environmental Management and Coordination Act 1999

This is the over-arching framework that provides for the establishment of appropriate legal instruments and institutions for the management of the environment. The Act provides for protection and conservation of the environment, environmental impact assessment, and environmental auditing and monitoring among others.

The EMCA 1999 provides under the Second Schedule, a list of projects that must undergo EIA. The Schedule lists major changes in land use as requiring EIA and a Report submitted to NEMA for review. Although the Act does not provide for Strategic Environmental Assessment, this is provided for in subsequent regulations and guidelines.

The Act also establishes the National Environment Management Authority (NEMA) whose mandate is to "exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment (Kenya Law Reports, 1999)"

The functions of NEMA under the Act are:

- Coordination of the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations;
- Prepare and issue an annual report on the state of the environment in Kenya;
- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities;
- Public education and awareness creation on environmental matters;
- Compliance and enforcement of environmental legislation;
- Enhancement of the effectiveness of the Provincial and District Environment Committees;
- Development of linkages involving the private sector, inter-governmental organizations, non-governmental organizations and government agencies of other states, on issues related to the environment; and
- Coordination and development of the necessary capacity for environmental management.

4.2.3 Environmental (Impact Assessment and Audit) Regulations, 2003

These Regulations stipulate how an EIA will be undertaken and what the EIA study report should contain. It also provides regulations on Environmental Audits (EA). These Regulations also provide for Strategic Environmental Assessment (SEA) of policies, Plans and Programs and detail the contents of a Strategic Environmental Assessment Report.

4.2.4 Environmental Management and Co-ordination (Water Quality) Regulations 2006

The Water Quality Regulations provide for the protection of lakes, rivers, streams, springs, wells, and other water sources. The Regulations provide that no person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the regulations.

This regulation is particularly relevant to the proposed master plan in view of the wastewater management plans proposed in the development. The plans include package treatment plants, oxidation lagoons and potentially recycling of treated effluent. Rironi area is also not served by a sewer system.

4.2.5 Environmental Management and Co-ordination (Waste Management) Regulations 2006

The Waste Management Regulations sets out standards for handling, transportation and disposal of various types of wastes. The regulations stipulate the need for facilities to undertake, in order of preference, waste minimization or cleaner production, waste segregation, recycling or composting. These regulations provide guidelines on how to store, transport and dispose any wastes that will be generated during the construction and operation phases of the proposed development.

4.2.6 Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

The regulations define noise as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. The regulations prohibit any person from making or causing 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. In the first to the third schedules to these regulations, maximum noise levels permissible in various environmental set ups have been set which shall be used as standards for compliance monitoring during construction and operation of all facilities in the RedCoral development.

4.2.7 Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations 2006

The Fossil Fuel Emission Control Regulations provide for acceptable emission standards in Kenya. Section 4 of the regulations states that any internal combustion engine for motor vehicles and generators must comply with the emission standards provided for in the First Schedule of those regulations. Hence anyone who operates such engines whether on the road, street, public highway or any premises, which emits smoke in excess of the emissions standard in the First Schedule contravenes the regulations and is liable to prosecution. Section 8 provides that any person intending to use any fuel catalysts other than those permitted by the authority to disclose it and seek prior approval. Any establishment (including construction sites and operational sites/facilities) that use generators as alternative sources of energy must take account of the regulation on the emission standards.

4.2.8 Environmental Management and Coordination (Air Quality) Regulations, 2014

These regulations provide for the safeguarding of the ambient air quality and give guidelines to prevent and control air pollution. The first and seventh schedules of the regulations provide a list with associated emission limits of prohibited, controlled, and un-controlled air pollutants. The regulations also give ambient

air quality tolerance limits. The regulations will be particularly relevant to the construction works (including transportation) and also to operational facilities.

4.2.9 Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009

These regulations provide for the protection of all wetlands on both private and public land. The regulations provide for sustainable exploitation of wetlands and are aimed at maintaining both the wetlands and hydrological, ecological, social and economic functions and services.

4.2.10 Environmental Management and Co-ordination (Conservation of Biological Diversity) Regulations, 2006

These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, inventory and monitoring of biodiversity and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties. These regulations will guide the identification and protection of any endangered/threatened species found on the development site. Proper environmental management will be required to conserve the biological diversity within the affected areas.

4.2.11 Environmental management and Co-ordination (Controlled Substances) Regulations 2007

In line with these regulations, the Kenyan government banned the Importation of Chlorofluorocarbons (CFCs) with effect from 1 January 2009, to ensure that Kenya is compliant with the provisions of the Montreal protocol on Substances that deplete the ozone Layer. This regulation makes it mandatory for industries and other stakeholders in Ozone depleting substance trades to obtain a license to import these substances. The ozone-friendly refrigerants, oil lubricants, and other ozone-friendly alternative chemicals to CFCs shall be the only ones that shall be licensed for importation for use in equipment related to the RedCoral development. No licenses shall be issued to any person to import CFCs.

4.2.12 The Water Act 2002

The Water Act, 2002, provides for the management, development, conservation, use and control of water resources and for the acquisition and regulation of rights to use water, to provide for the regulation and management of water supply and sewerage services. The Act focuses on two key sub-sectors- Water Resources Management (WRM) and Water and Sanitation Services (WSS). The Water Act 2002, provides for a reformed legal/institutional framework for the management and development of Kenya's water resources and the provision of water services. The Act establishes relevant authorities and creates catchment management bodies and seven regional service boards. It specifies “public participation”, in relation to any application made, or action proposed to be taken. The act further provides for the strategic management of the water resources.

4.2.13 The Water resource management rules 2007

These rules apply to all policies, plans, programmes and activities that are subject to the Water Act and apply to all water resources including lakes, water courses, streams and rivers whether perennial or seasonal, and aquifers. The rules provide that any portion of land in excess of one hectare which is natural subject to seasonal or permanent flooding and has the ecological characteristics of a swamp or marsh shall be considered to be a wetland. Any such wetland found on or near a development site shall then be subject to management in line with the regulations. The Rules also provide for groundwater development authorization

and regulation. This will be significant for the RedCoral development as the proposed main source of water is boreholes.

4.2.14 The Public Health Act (Cap 242)

Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. 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. Such nuisance or conditions are defined under Section 118, waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into a public street or into the gutter or side channel or water house, irrigation channel or bed not approved for discharge is also deemed as a nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin. This will be of particular relevance to any temporary camps set up during the construction phase of the development.

4.2.15 The Wildlife Conservation and Management Act, 2013

This Act provides for the protection, conservation and management of wildlife in Kenya. The provisions of this Act should be applied in the management of wildlife and their habitats located on or near the development site.

4.2.16 The Physical Planning Act, 1996

Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section allows for prohibition or controls the use and development of land and buildings in the interest of proper and orderly development of an area. Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation for any building without development permission granted by the respective local authority. Finally, section 36 states that, if in connection with a development application, the local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit, together with the application, an EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by NEMA and should be followed by annual environmental audits.

4.2.17 The Employment Act 2007

The Act deals with conditions of employment and the rights of workers including for paternity leave for fathers. All workers, including those employed during the construction phase, will be employed under this Act which includes provision with respect to minimum wage, working conditions and time, and also in the resolution of disputes.

4.2.18 Occupational Safety and Health Act, (OSHA) 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. Section 3 (1) states “that the Act shall apply to all workplaces where any person is at work, whether temporarily or permanently”. Under this Act, the duties of the Occupier are provided thus in Section 6. Key among them is that every occupier shall ensure the safety, health and welfare

at work of all persons working in his workplace. An occupier who fails to comply with a duty imposed on him under this section commits an offence and shall on conviction be liable to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding six months or to both. Part VII of the Occupational Safety and Health Act (OSHA), 2007 elaborately deals with machinery safety requirements, mainly from the point of view of avoiding accidents and injuries at work. The proponent should ensure commitment to this Act by any selected Contractors for the proposed works through contractual agreements.

4.2.19 The Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005

The Rules provide for the maximum noise exposure levels for workers in places of work and for the provision of protective equipment for those exposed to high noise levels. An occupier shall also institute noise reduction measures at the source of noise in the workplace.

4.2.20 Factories and Other Places of Work (Fire Risk Reduction) Rules 2007

The Rules provide for the use of fire resistant materials in the construction of workplaces where flammable substances are used, manufactured or manipulated. The substances shall be kept in small quantities as is reasonably practical having regard to the processes or operations being carried on. These substances shall be conveyed through enclosed systems incorporating pipelines or vessels designed to avoid spilling of the substance. The Rules provide for stringent housekeeping practices, minimum distances in machinery and other structures layout, proper ventilation of workplaces, and earthing of electrical equipment. The Rules also provide for the fitting, marking and maintenance obstruction-free fire exits in every workplace, installation and maintenance of fire detection and fighting systems, and the identification and training of firefighting personnel. A fire safety policy shall be established and implemented for every workplace, while a fire audit shall also be carried out annually for each workplace.

4.2.21 The Penal Code (Cap. 63)

Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use, is guilty of an offence. Section 192 of the same act says a person who makes or violates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighborhood or those passing by, commits an offence punishable by law.

4.2.22 Traffic Act Cap 403

The Traffic Act prohibits air pollution through Section 51 which requires that motor vehicle use proper fuels. The Act requires that every vehicle be so constructed and used as not to emit any smoke, or visible vapour. The amendment further prohibits the use of any stationary internal combustion engine, discharging exhaust gas into the atmosphere without treatment.

4.2.23 Energy Act, 2006

The Act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any or all of these purposes. The Act provides for monitoring of energy consumption by each facility through installation of a

meter, and Conservation of energy, auditing and analysis of energy consumption in a building. The Act establishes an energy commission, which is the main policy maker and enforcer in the energy sector.

4.2.24 The Civil Aviation Act, Cap 394

This act mandates the Kenya Civil Aviation Authority (KCAA) to authorize and approve the height of any masts put up to ensure the safety of flying aircraft. This will be of relevance if any masts will be erected on the premises.

4.2.25 The Land Act, No. 6 of 2012

The Land Act of 2012 consolidates and harmonizes all land related laws into one legislation for ease of administration and management of land in Kenya. The Act repealed The Way leaves Act, Cap 292 and The Land Acquisition Act (295) and amended a number of laws that previously provided legal framework for compulsory land acquisition for public infrastructure projects. Part VIII of The Land Act No. 6 of 2012 supplements the constitutional basis of compulsory land acquisition, setting the procedures and regulations that explain how the compulsory purchase power may be exercised for the purposes of "public interest". A variety of bodies performing public functions can request that compulsory purchase powers be exercised on their behalf, including government ministries, county governments and parastatal organizations supplying necessary utilities. The relevant authority in the case of compulsory purchase is the Cabinet Secretary in charge of Lands and the executing office charged with the procedural issues is that of the National Land Commission (NLC). Every person having an interest or right in or over property which is compulsorily taken possession of or whose interest in or right over any property is compulsorily acquired has a right of direct access to the Land and Environment Court for the determination of his interest or right, the legality of the taking of possession or acquisition of the property, and the amount of any compensation to which he is entitled.

4.2.26 Land Registration Act No. 3 of 2012

The Land Registration Act, No. 3 of 2012 repealed previous legislations such as the Indian Transfer of Property Act, The Government Land Act, The Registration of Titles Act, The Land Titles Act and The Registered Land Act. Section 7 provides for the established and maintenance of a land register and a community land register for each registration unit containing the cadastral maps, parcel files, geo-referenced plans, presentation book, names of proprietors and a register of all powers of attorney. Sections 24, 25, and 26 provide that the details of the register and the issued certificate of title or lease are the prima facie and conclusive evidence of absolute ownership of any property. The rights conferred by the registration cannot be challenged except on grounds of fraud and misrepresentation or the title was acquired illegally, un-procedurally or through a corrupt scheme. Sections 37, 40, 42 and 49 allows a registered owner to voluntarily transfer the rights, in whole or partially, to any other party, either with consideration or without consideration and the transferee shall posses all the rights same as the original owner. To aid in identification of the location of land in each registration district, the Act has provided for the preparation of cadastral map for every registration unit. The Act further requires boundaries of the various parcels to be geo-referenced, suggesting a shift to fixed or easily identifiable boundaries. The alteration of the boundaries can only occur with the concurrence of the office responsible for survey of land and the Registrar. It is now an offence under Section 21 to interfere with marks indicating boundaries.

4.3 International Conventions Applicable in Kenya

Kenya has ratified various international conventions on environment that are applicable to this study. Conventions are agreements that are legally binding on states that have become parties to them. The Conventions include:

4.3.1 International Convention on Biological Diversity (1992)

This Convention promotes the protection of ecosystems and natural habitats, respects the traditional lifestyles of indigenous communities, and promotes the sustainable use of resources.

4.3.2 The World Heritage Convention (1972)

The Convention is concerned with cultural and natural heritage. It deals with monuments and areas that are deemed to be of "outstanding universal value" in terms of beauty, science and/or conservation and whose deterioration or disappearance would be a loss to all the nations of the world.

4.3.3 The Ramsar Convention 1971

This Convention underpins the importance of wetlands and water birds and governs wetlands of international importance such as Lake Nakuru, Lake Baringo, and Lake Natron. Kenya is therefore obliged to avoid degradation of wetlands under its jurisdiction.

Kenya has also ratified which prohibits trade in species such as Dugongs and also in Ivory. The proponent will need to ensure that these important conventions are not violated during construction, operation or decommissioning of the proposed projects.

4.3.4 The United Nations Framework Convention on Climate Change (UNFCCC or FCCC)

This is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED). The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits such as the Kyoto Protocol.

Other Conventions ratified by the Kenya Government include the Agreement of the Conservation of Eurasian Migratory Water Birds (2001), the African Convention on the Conservation of Nature and Natural Resources (1968), and the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973.

4.4 Permits and licenses required during construction and operation of the development

The table below provides a summary of the licenses and permits required before commencement of construction, construction stage and operation stages of the proposed development.

Table 7: Relevant legislation and permits/licenses required

Legislation	Activity requiring permit	Permit/license required
• Environmental Management and Coordination Act 1999	• Change in land use;	Environmental Impact Assessment licenses

• Environmental (Impact Assessment and Audit) Regulations, 2003	• Development of infrastructure, residential, commercial, industrial precincts	
Environmental Management and Co-ordination (Water Quality) Regulations 2006	• Discharge of treated effluent into lagoons	Effluent discharge license
Environmental Management and Co-ordination (Waste Management) Regulations 2006	• Operation of a waste treatment plant • Operation of an incinerator • Transportation of waste	• Waste transportation license • License to own/operate a waste treatment plant/disposal site
Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	Construction activities	License to emit noise/vibrations in excess of permissible levels
Environmental Management and Coordination (Air Quality) Regulations, 2008	Operation of an incinerator	Emission license
The Water resource management rules 2007	Abstraction of ground water	Water abstraction permit
Occupational Safety and Health Act, (OSHA) 2007	Construction activities at the site	Certificate of Registration as a workplace

5. Overview of stakeholder engagement activities undertaken

5.1 Purpose of the stakeholder consultation and participation

The stakeholder engagement process sought to achieve the following:

- Inform the stakeholders about the proposed plan and provide opportunities for influencing/amending the plans;
- Collect stakeholders' views on the proposed plan including potential positive/negative impacts stakeholders associate with the proposed plan and Stakeholders' preferred development;
- Get local knowledge on any sensitive areas within the plan scope (physical/environmental, cultural or proposed facilities); and
- Get expert advice on land use/ area zoning, water availability and supply, power and road infrastructure in the area.

5.2 Stakeholder Identification

A stakeholder analysis was conducted to identify the stakeholders after which an engagement and disclosure plan was developed to ensure that the process was meaningful and productive.

The identified stakeholders included:

- The neighboring residents and institutions;
- The local authority i.e. Kiambu County Government;
- Rironi Self Help Water Project;
- County Administration including the Assistant County Commissioner, area chief and sub-chiefs;
- Limuru Water and Sewerage Company (LIWASECO);
- Kenya Power
- Water Resource Management Authority (WRMA);
- Kenya National Highways Authority (KeNHA);
- Kenya Rural Roads Authority (KeRRA);
- Kenya Railways; and
- The National Environment Management Authority (NEMA) – Kiambu County.

The identified stakeholders were then categorized into two groups: Community and Institutional Stakeholders. The Community Stakeholders were comprised of the area residents and community representatives such as the Member of County Assembly for Rironi Ward, Member of Parliament for Limuru, the area Chief and sub-chiefs among others. The stakeholders also included representatives such as the clergy drawn from the local churches, and school heads from schools in the area. The Institutional stakeholders on the other hand comprised of the various government bodies with jurisdiction over infrastructure found in the area and others with mandate to provide various services in the plan area.

Two workshops were held: one for the community stakeholders and the other for the institutional stakeholders in which the plans were presented and discussions initiated to obtain concerns, alternative views and ideas. Most of these stakeholders viewed the plan as a worthwhile investment in the area and were therefore not opposed to it. The general perception among the community stakeholders was that the development would lead to creation of employment and business opportunities, and growth of infrastructure and other services/amenities in the area. The concerns raised were on whether the plans included an

educational facility to complement the existing facility in the area, whether a medical centre would be included, and on the fate of the existing community water supply infrastructure on site. Other concerns were on potential nuisances/pollution from the waste emanating from the development, and on the types of industries that are envisaged in the development due their pollution potential.

Institutional stakeholders' concerns were on issues such as:

- WRMA - Existence and adequacy of a discharge control plan for the development that was necessary before granting an application for a water abstraction per permit;
- KeNHA and KeRRA -Provision of adequate road reserves, acceleration/deceleration lanes and suitable junction designs for access roads joining government roads such as A 104, C62 and D378;
- NEMA – development of an integrated solid waste management strategy in the plans, a proper traffic management system for the development, and development of an effective effluent management system

These concerns informed the discussion on identification of impacts and evaluation of alternatives in the SEA study.

Plate 2: Community stakeholders meeting held near the development site

Plate 3: Institutional stakeholders meeting held at Sigona Golf Club

6. Prediction and evaluation of impacts including cumulative effects

6.1 Introduction

This section identifies the potential beneficial and adverse impacts likely to be associated with execution of the plan. The potential impacts are identified against the following themes:

- Traffic and Transport
- Water Resources
- Energy Resources
- Noise and Vibration
- Air Quality
- Waste
- Geology and Soils
- Biodiversity and Nature Conservation
- Health and Safety
- Sustainable Procurement, Economy and Employment

The potential impacts are discussed below while their significance and magnitude is outlined in section 6.12.

6.2 Traffic and Transport

The Proposed development is likely to have impacts on traffic and transportation both during construction and operation phases of the development. The impacts include such as: an increase in the number of vehicles with the resultant increase in traffic along the A 104 Nairobi – Nakuru Road, C62 – Limuru Road, and the D378 Ngecha - Chunga Mali Road. This may in turn lead to requirements for additional maintenance of these roads due to damage caused by the vehicles and especially from the weight of construction vehicles.

Increased vehicular traffic may also lead to higher air and noise emissions adversely affecting the local air quality and ambient noise levels.

The proposal to have a railway station on the eastern side of the development is however likely to reduce vehicular traffic when it is an operational commuter transport to/from the RedCoral Development.

6.3 Water Resources

The development is likely to lead to increased demand on water resources both for construction purposes and during operations. Although construction phase water demand has not been calculated, the demand during operation is estimated at 1630m^3/day. This water will be mainly sourced from boreholes to be drilled on site. Without conservative use of the water resources, there is likely to be an adverse impact on ground water resources leading to depletion of groundwater resources. Measures will therefore be instituted in the construction and operation phase environmental management plans to ensure conservation of water resources.

Waste water from the construction site/activities, lack of adequate spill control measures during construction and percolation of contaminated water from lagoons has potential to pollute soil and ground water resources.

It is therefore paramount to institute adequate measures to manage wastewater discharges, spillages and wastewater treatment processes in order to avoid contamination of the soil and groundwater.

6.4 Energy Resources

The proposed development will result in a higher demand on energy resources both during construction and operation phases of the development. The forms of energy to be utilized include grid energy and fossil fuel. Construction activities will mostly require fossil fuel in the running of construction vehicles, and generators. Some grid energy will also be required during construction but will be more so required for lighting and powering of machinery/equipment in residential, commercial and industrial establishments in the operation phase.

6.5 Soils and Geology

Development will affect the soil and geology of the site in ways such as depletion of the local soil resource from excavation and carting away of spoil material, and soil degradation from compaction and soil sealing leading to increased surface runoff and soil erosion. Spillage of hazardous construction chemicals (such as oils, fuel, grease, paints, solvents, curing compounds, adhesives, acids, soil stabilizers and binders etc) may also lead to soil contamination while importation of soil in landscaping and fill activities may lead to introduction of invasive species / noxious weeds and pathogens such as bacteria, fungi and nematodes. It is considered that these impacts can be mitigated and shall be adequately addressed in construction/operation phase Environmental Management Plans.

6.6 Biodiversity and nature conservation

The proposed site and the surroundings, due to the existing vegetation cover, forms good habitats and forage grounds for birds, small mammals and herpertofauna. Although no rare/protected species have been identified so far, the loss of vegetation cover at the site will lead to a loss of biodiversity, habitat and forage grounds for this wildlife. It was however noted that the vegetation cover to the north eastern part of the plot is mostly comprised of exotic *Acacia mearnsii* tree stands with invasive tendencies. Clearing of the tree stand and replacement with indigenous vegetation will enhance local plant diversity possibly also attracting other faunal species. An elaborate management plan to reduce and or control the spread of *A. mearnsii* is required where the cleared *A. mearnsii* tree stands are replaced with indigenous vegetation.

6.7 Air quality

The local air quality will be impacted both during the construction and operation phases of the development. This will mostly be from dust emitted during excavation/earthworks and aggregate transportation to the site, and from construction vehicles and machinery emitting oxides of carbon, nitrogen, and sulphur into the atmosphere during the construction phase. Upon completion of the development, the most likely sources of air pollution include emissions from standby generators, motor vehicles and kitchen fires. Other potential sources would be from incineration on site, and the sewer treatment plants/waste transfer sites. With adequate measures in the construction/operation phase environmental management plans, these impacts can be mitigated.

6.8 Noise and vibrations

Constructions works will most likely result in noise generation as a result of the machines in use e.g. excavation equipment, mixers and construction vehicles delivering materials to site. The noise is expected to last for the entire construction period and is likely to affect the neighboring residents and institutions. Off-site noise will also be experienced near and along the access roads to the construction materials sources. The noise and vibrations are however not expected to increase considerably during project operation.

Potential sources of noise and vibrations are likely to be standby generators installed (if at all) by future residents which would only be active only in times of grid-power outages.

6.9 Health and safety

During construction, safety hazards are likely to increase resulting in a possible increase in accidents involving workers and/or the general public. The construction works will expose workers to occupational health and safety risks and injuries resulting from accidental falls, or use of hand tools and construction equipment. Safety hazards are also posed to the public especially pedestrians and motorists passing near the site while the lack of provision of adequate sanitary facilities can lead to health hazards affecting both workers and the surrounding community. When the development is complete and in operation, potential health and safety hazards may arise in the event of a lack of adequate facilities, protection measures, worker-protection measures, and general laxity in adherence to best practices and OSHA, 2007 regulations. Adequate health and safety plans will therefore be implemented during construction/operation to mitigate all foreseeable health and safety risks in the development.

6.10 Waste

Wastes likely to be generated during the construction phase include spoil materials (logs, soil and rock from vegetation clearance and excavation) packaging materials such as paper, polythene, plastic and metallic packaging, reject materials including damaged bricks, concrete and mortar, among others. Adequate waste management measures are required as dumping/careless disposal both on-site and off-site will interfere with aesthetics and lead to creation of breeding grounds for vermin.

The households, commercial and industrial developments are also likely to generate significant amounts of organic/inorganic wastes. These wastes require proper handling and disposal to avoid environmental pollution. Inadequate management of solid and sewerage waste from the facilities can lead to pollution and creation of human health hazards endangering the residents and the public. A solid waste strategy has however been developed to address these concerns. Packaged sewerage treatment plants are being planned.

6.11 Sustainable Procurement and creation of employment/business opportunities

Construction materials that will be used include bricks and dressed stone, ballast, sand, cement, and other precast elements. These materials will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Unsustainable extraction of these resources can cause environmental damage. To avoid this, the appointed contractor(s) ought to source construction materials such as sand, aggregate and hard core from registered and approved quarries and sand mining firms whose sites have undergone satisfactory environmental impact assessment and are licensed according to the regulations. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

Employment opportunities are likely to be created for both skilled and unskilled workers who include architects, engineers, surveyors, contractors and casual laborers during the construction phase of the development. On the other hand, locally sourced workforce will be employed to support households and commercial establishments in the premises during operation phase of the development.

6.12 Appraisal matrix

The Appraisal Matrix below illustrates the potential impacts, their magnitude and suggests mitigation, where appropriate, to avoid, reduce, or remediate the potential impacts.

To avoid repetition throughout the table the following applies to each theme

A	B	C	D	E
Major Positive	Minor Positive	No Impact	Minor Negative	Major Negative

ST – Short Term
LT – Long Term

Table 8: Appraisal matrix

Theme	Impact					Description of Effect(+ve and/or –ve) (ST and/or LT)
	A	**B**	**C**	**D**	**E**	
Traffic and Transport						
				√	√	***Construction*** • Increased number of vehicles during construction phase may lead to higher levels of emissions (**ST**) (**Minor-ve**); • Increase in the number of vehicles may cause an increase in traffic along the A 104 Nairobi – Nakuru Road, C62 – Limuru Road, and the D378 Ngecha-Chunga Mali Road(**ST**) (**Major-ve**); • Roads and tracks to be utilized may require additional maintenance due to damage caused by the weight of construction vehicles. (**ST**) (**Minor-ve**).
		√		√	√	***Operation*** • The increased number of vehicles (of those residing at the site and those patronizing the commercial areas) may lead to higher levels of emissions (**LT**) (**Minor-ve**) • The increase in the number of vehicles may also cause an increase in traffic along A 104 Nairobi – Nakuru Road, C62 – Limuru Road, and the D378 Ngecha - Chunga Mali Road (**ST**) (**Major-ve**); • The mixed use nature of the site will provide an opportunity for residents to walk to their places of employment reducing the need for vehicular modes of transport. (LT) (Major +ve) • A railway station serving the development will help in reduction of commuter and goods transport traffic (LT) (Minor+ve)
Water Resources						
				√	√	***Construction*** • Increase in the amount of water used by workers and construction activities (**ST**) (**Minor -ve**); • There is the potential for contamination from construction plant to enter the underlying aquifer (**ST**) (**Major-ve**); and • There is the potential for silty run-off from construction activities to enter the local hydrological features (**ST**) (**Major -ve**).
		√		√	√	***Operation*** • There is the potential for contamination from activities such as sewerage disposal through treatment plants and lagoons to enter the underlying aquifers and hydrological features (**LT**) (**Major-ve**) • Operational water requirements for households and commercial enterprises will lead to increased consumption of water. (**LT**) (**Major -ve**) • Rain water capture and non-portable water infrastructure will facilitate the continued use of non-portable water (**LT**) (**Minor +ve**) • Design will consider allowing excess treated waters to discharge into the proposed lagoons to support the aquatic habitats (**LT**) (**Minor +ve**) • Excessive abstraction of ground water can lead to a decline in water levels in the aquifers and unfavorable changes in water quality (**LT**) (**Major -ve**)
Energy Resources						
				√		***Construction*** • Construction activities will utilize fossil fuel and electricity increasing the demand (**ST**) (**Minor -ve**)
				√		***Operation*** • The proposed development is likely to increase the demand for grid supplied energy owing to lighting requirements and the large array of electronic equipment to be used in the homes and commercial establishments. (**LT**) (**Minor -ve**)

Theme	Impact					Description of Effect(+ve and/or –ve) (ST and/or LT)
	A	B	C	D	E	
Soils and Geology						
				√	√	***Construction*** • Earthworks and excavation of soil and rock will result in the generation of spoil materials (**Major -ve**) • Offsite disposal of the soil will lead to a depletion of soil resources at the site (**Minor -ve**) • Importation of fertile soil from other areas for landscaping purposes to enable planting of ornamental vegetation maybe required. Large scale importation of soil for the project may lead to depletion of soil resources in the source areas (**Minor -ve**) • The imported soil can also contain diseases and pests such as animal and plant viruses, bacteria, fungi, nematodes, noxious weeds, and the life stages of destructive insects that can endanger biological resources in the recipient or surrounding areas (**Minor -ve**) • Construction activities at the site may lead to soil sealing especially when heavy construction machinery and trucks compact the surface soil; (**Minor -ve**) • Soil compaction and sealing may lead to increased surface runoff and soil erosion from the site; (**Major -ve**) • Any spillage of hazardous materials on site is likely to cause soil contamination and/or eventual surface/groundwater contamination. The hazardous materials include oils, fuel, grease, paints, solvents, curing compounds, adhesives, acids, soil stabilizers and binders etc; (**Major -ve**)
Biodiversity and nature conservation						
		√		√		• The proposed site and the surroundings, due to the existing vegetation cover, forms good habitats and forage grounds for birds, small mammals and herpertofauna. Loss of vegetation cover at the site will lead to a loss of biodiversity, habitat and forage grounds for these wildlife; (**Minor -ve**). • It is however noted that the vegetation cover to the north eastern part of the plot is mostly comprised of exotic *Acacia mearnsii* tree stands with invasive tendencies and having recently colonized the fallow land possibly after a bushfire incident(s). clearing of these tree stand and replacement with indigenous vegetation will enhance local plant diversity possibly also attracting other faunal species (**Minor +ve**)
Air quality						
				√	√	***Construction*** • Dust will be emitted during excavation/earthworks and aggregate transportation to the site, affecting the local air quality. This is likely to affect site workers and the general public in the neighborhood, in extreme situations leading to respiratory problems. (**ST**) (**Major-ve**) • Construction vehicles and machinery are also likely to emit oxides of carbon, nitrogen, and sulphur, further compromising the local air quality (**ST**) (**Minor-ve**)
				√		***Operation*** • Standby generators, motor vehicles and kitchen fires are likely to be the most significant sources of air pollution from the development when in operation (**LT**) (**Minor-ve**) • Potential to cause ozone depletion if ozone-depleting substances are used in air conditioning and refrigeration in the development (**LT**) (**Minor-ve**)
Noise and vibrations						
				√		***Construction*** • Constructions works will most likely result in noise generation as a result of the machines in use e.g. excavation equipment, mixers and construction vehicles delivering materials to site. (**ST**) (**Minor-ve**) • The noise is expected to last for the entire construction period and is likely to affect the neighboring residents and institutions, (**ST**) (**Minor-ve**) • Off-site noise will be experienced near and along the access roads to the construction materials sources (**ST**) (**Minor-ve**)
				√		***Operation***

Theme	Impact					Description of Effect(+ve and/or –ve) (ST and/or LT)
	A	B	C	D	E	
						• Noise and vibrations are not expected to increase considerably during project operation. Potential sources of noise and vibrations are likely to be standby generators installed (if at all) by future residents which would only be active only in times of grid-power outages; (**LT**) (**Minor-ve**)
Health and safety						
					√	***Construction*** • Safety hazards are likely to increase resulting in a possible increase in accidents involving workers and/or the general public (**ST**) (**Major-ve**) • The construction works expose workers to occupational health and safety risks and injuries resulting from accidental falls, or use of hand tools and construction equipment; (**ST**) (**Major-ve**) • Safety hazards are also posed to the public especially pedestrians and motorists passing near the site; (**ST**) (**Major-ve**). • The lack of provision of adequate sanitary facilities can lead to health hazards affecting both workers and the surrounding community; (**ST**) (**Major-ve**)
					√	***Operation*** • Potential health and safety hazards may arise in the event of a lack of adequate facilities, protection measures, worker-protection measures, and general laxity in adherence to best practices and OSHA, 2007 regulations (**LT**) (**Major-ve**)
Waste						
					√	***Construction*** • Wastes likely to be generated include spoil materials (logs, soil and rock from vegetation clearance and excavation) packaging materials such as paper, polythene, plastic and metallic packaging, reject materials including damaged bricks, concrete and mortar, among others; (**ST**) (**Major-ve**) • Dumping around the site will interfere with the aesthetic status and lead to creation of breeding grounds for vermin. Improper disposal of the wastes off-site could also cause nuisance and create breeding grounds for vermin; (**ST**) (**Major-ve**)
					√	***Operation*** • Households and the commercial establishments are likely to generate significant amounts of organic/inorganic wastes. These wastes require proper handling and disposal to avoid environmental pollution; (**LT**) (**Major-ve**) • Inadequate management of solid and sewerage waste from the facilities can lead to pollution and creation of human health hazards endangering the residents and the public; (**LT**) (**Major-ve**)
Sustainable Procurement						
				√		• Construction materials that will be used include bricks and dressed stone, ballast, sand, cement, and other precast elements. These materials will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Unsustainable extraction of these resources can cause environmental damage (**LT**) (**Minor-ve**)
Economy and Employment						
		√				***Construction*** • Employment opportunities will be created for both professionals and skilled workers who include architects, engineers, surveyors, contractors and casual laborers; (**MT**) (**Minor +ve**).
	√					***Operation*** • Locally sourced workforce will be employed to support households and commercial establishments in the premises (**LT**) (**Major +ve**).

6.13 Risk Assessment

This section addresses the risks associated with impacts to the environment that could occur as a result of mishaps or failures during the construction, operation, and decommissioning phases of the proposed Plan. An identification of the environmental hazard, the level of associated risk, and the control/recovery

measures that will be implemented to minimize the risk of occurrence and impact of the hazard is given in the table below.

Table 9: Environmental Risk Assessment

Risk	Impact	Level of Risk			Likelihood			Control measure
		L	*M*	*H*	*HL*	*LK*	*UK*	
Failure of construction materials/equipment	• Accidents resulting in injuries to workers and/or public			√		√		• Use of quality materials • Follow design specifications • Proper maintenance/servicing of equipment
Failure to observe health and safety procedures and mechanisms	• Accidents resulting in injuries to workers and/or public			√		√		• Disciplinary measures for offending construction workforce • Awareness creation • Health and safety training
Failure to observe traffic management principles	• Accidents involving workers and the general public			√		√		• Vetting of construction workforce • Disciplinary measures for offending construction workforce • Awareness creation
Failure of erosion control mechanisms	• soil erosion • siltation of surface water resources		√			√		• Proper design and maintenance/servicing of erosion control structures
Failure of spill/leakage control mechanisms	• Soil contamination • Ground water contamination			√		√		• Proper design of containment structures • Monitoring of containment structures • Training in spill response
Failure of the waste treatment facilities	• Human Health hazards • Pollution of ground water resources • Poor air quality			√			√	• Adequately sized treatment plants • Regular servicing of treatment plants • Rapid response to process failures • Regular monitoring of discharge quality
Failure to involve community in matters that touch on shared resources or failure to address community concerns	• Potential hostility of the community towards the development			√			√	• Community liaison and immediate response to complaints
Failure of noise control mechanisms	• Noise pollution and nuisance		√			√		• Community liaison and immediate response to complaints
Failure of air quality control mechanisms	• Air pollution • Nuisance • Health hazards •		√			√		• Community liaison and immediate response to complaints

Key: L – Low; M – Medium; H- High; HL – Highly likely, LK – Likely; UK - Unlikely

7. Alternative Plan Options Considered and Compared Against Environmental Indicators and Justification for Preferred Alternatives

7.1 Structure plan options

The land-use planners developing the structure plan modelled and presented various scenarios which had varying densities of residential developments. The main impact of these densities was in the differences in the total resident population expected. This would in turn have a bearing on traffic, water and power demands of the development, and on waste (solid and effluent) generated. The residential development density preferred was found to be the optimal utilization of land considering economics such as the high land-prices in the area and the need to provide affordable properties to the market, as well as environmental considerations such as the need to have suitably-sized green areas/open spaces.

7.2 Power supply options

The power demand and supply study on the requirements for the development confirmed the demand to be approximately 44MVA and that this would require a dedicated 66kv line from KPLC. The power line could either originate from Limuru substation (whose current capacity is 1x23MVA &1x5MVA but will be upgraded to 2x23MVA in the near future), Rironi substation (which is currently under construction and is to have a capacity of 2x23MVA) or Uplands substation (whose capacity is expected to be 2x23MVA). Rironi substation is however the nearest at approximately 10km from the site and tapping from this substation would have the least impact in terms of capital cost, as well as less environmental and social disturbance in establishment as compared to tapping from the other substations.

7.3 Water supply options

It was estimated that of the 1,630m^3/day of total water demand, 1,209m^3 would be the potable water requirement while 431m^3 would be the non-potable water requirement for the development daily. Studies on water demand and supply options arrived at water supply from 8 boreholes to meet the potable water requirements of the development. This is in recognition of the fact that the area is not served by piped water supply and prospects this provision in the near future are slim. Further, non-potable water requirements for the development would be met from rainwater harvesting and potentially recycling of treated effluent. It is acknowledged that a significant amount of water will be generated from rooftops and other hard stands in the development as well as from treated effluent. If utilized for irrigation, flushing and cleaning, this water could significantly lower the demand on the highly valued local ground water resource as well as the final storm water and effluent output from the development.

7.4 Wastewater management

Detailed studies were carried out on wastewater management for the development. These included options for both handling and disposal of the wastewater. An option considered for wastewater disposal was connection to LIWASECO's sewerage system which comprised of an oxidation ditch located outside of Limuru town Centre. The sewage treatment plant was however found to be overloaded and unable to accommodate any new sources of effluent. Further, due to the differences in elevation, it was not possible to drain effluent from RedCoral by gravity to the LIWASECO sewerage system. Connection into the existing system would have to be by use of a pumping station which would not be a desirable option because of the high operations and maintenance costs that would arise out of pumping sewage. Onsite sanitation strategies were therefore considered for RedCoral and their associated advantages/disadvantages are provided in the following table:

Table 10: Wastewater treatment methods

Treatment Process	Advantages	Disadvantages
Waste stabilization ponds	▪ No power requirements ▪ Very low operations and maintenance requirements ▪ No mechanical installations ▪ Very simple method of treatment	▪ High land requirement ▪ Odor nuisance, particularly from the anaerobic ponds if incorporated in the system ▪ Sensitive to temperature variations ▪ Requires relatively flat or gentle slopes to avoid extensive excavations ▪ May require special lining to avoid groundwater contamination
Constructed wetlands	▪ Have substantial capacity for wastewater treatment	▪ High land requirement ▪ Requires relatively flat or gentle slopes ▪ Requires specific aquatic plants ▪ Appropriate for small institutions/developments, not for large wastewater treatment
Aerated lagoons	▪ Detention time less than in stabilization ponds ▪ Less land requirement as compared to stabilization ponds	▪ High O&M requirements
Activated sludge process	▪ Any degree of treatment is possible ▪ Final effluent is clear and odorless ▪ Low land requirement ▪ Freedom from odor nuisance ▪ Freedom from nuisance due to flies ▪ Recommended for treatment of sewage from large communities (not small works)	▪ Sensitive to organic loading particularly for industrial wastes which result in bulking of sludge ▪ High O&M requirements ▪ High skilled management ▪ Sensitive to shock loading ▪ Produces large quantity of sludge whose disposal is a problem
Trickling filters	▪ Durability in all weather conditions and in the presence of corrosive effluents ▪ Does not upset for variation of hydraulic or organic loading ▪ Low O&M cost	▪ Limitation in volumetric loading ▪ Significant loss of head ▪ Nuisance due to flies
Oxidation ditches	▪ Relatively low land requirement	▪ High O&M requirements
Rotating biological contractors	▪ Can withstand hydraulic and organic shock loads ▪ Low land requirement	▪ High O&M requirements
Packaged treatment works	▪ Low land requirement ▪ Modular ▪ Easy to construct ▪ Final effluent is clear and odorless ▪ Any degree of treatment is possible ▪ Suitable for small communities	▪ High O&M requirements
On-site treatment systems e.g. septic tanks, latrines	▪ Low land requirement ▪ Low capital cost ▪ Low O&M cost ▪ Easy to construct	▪ Applicable only at household levels and small institutions ▪ High potential to contaminate ground water ▪ Need for periodic de-sludging ▪ Nuisance due to odors and flies

The operations and maintenance requirements/costs mentioned above are associated predominantly with the power consumption by the electromechanical installations.

A sewerage system was arrived upon whereby a gravity sewer network covering 92% of the land area within the property would be established, while on-site sanitation systems would cover the remaining 8% of the land that cannot be drained by gravity. These would include septic, conservancy tanks or small modular

packaged treatment plants. The sewer system would drain the effluent into five sewage treatment sites where packaged wastewater treatment units would treat the effluent to the specified standard in NEMA's Water Quality Regulations. Since there is no natural water body adjacent to the proposed development which can be a recipient of the treated effluent, the treated effluent would be stored in a holding lagoon from where recycling may be done to flush toilets, irrigate lawns or allow percolation for groundwater recharge. A separate and engineered storm water drainage system will be provided as part of the roads to capture storm water within the site and direct it to established external stormwater networks where possible

To manage sludge from the treatment plants and septic/conservancy tanks, an exhauster will be provided to de-sludge and dispose in LIWASECO's drying beds or other approved disposal sites.

7.5 Solid waste disposal options

A solid waste management study was carried out aimed at exploring the options available for disposal of solid wastes generated from the development. The options identified were the collection and disposal of waste in a designated landfill or development of an integrated solid waste management strategy for the proposed development.

It was established that Kiambu County has five designated open dumpsites none of which is engineered. There were however plans for the design and construction of a sanitary landfill spearheaded by the County Government. The timeframe for development and commissioning of this landfill is uncertain and could possibly be beyond the five-year horizon. Further, it was also established that Limuru and Kikuyu Municipalities shared a dumpsite located about 3km to the north-west of Limuru town and which was operated by Limuru Municipality.

The table below presents the general sources of solid waste expected from the proposed RedCoral development;

Table 11: General sources of solid waste

Source	Typical facilities	Types of solid wastes
Residential	Single-family and multifamily dwellings, low, medium and high-rise apartments, etc	Food wastes, rubbish, ashes, special wastes
Retail/Commercial	Stores, restaurants, bars, offices, hotels, schools and other institutions	Food wastes, rubbish, ashes, special wastes, occasionally hazardous wastes
Open areas	Streets, parks, vacant lots, play grounds, recreational areas	Special wastes, rubbish
Industries	Warehouses, offices, vacant lots, processing plants etc	Rubbish, special wastes, food wastes, occasionally hazardous wastes.

An integrated waste management strategy was arrived upon whereby solid waste would be collected and disposed in an environmentally and socially satisfactory manner using the most economic means available. This would entail collection, sorting recycling, compositing, land filling and incineration.

Solid waste would be collected from the various premises within the proposed development following application of waste reduction techniques at source including sorting, compositing and separation for recovery. The solid waste would then be taken to a transfer station where it would be held for collection by either by Limuru Municipal Council or a private operator for eventual disposal. At the transfer station, further waste reduction technologies (i.e. sorting, recycling and incineration) would be employed. An incineration plant is proposed at the transfer station where the combustible waste would be burnt to reduce the quantity of waste transported to the dumpsite. Future upgrading measures for the incinerator may include generation of energy from waste incineration.

8. Linkages between the Proposed Plan and other Plans Policies and Programmes

8.1 The Kiambu County Integrated Development Plan

The Kiambu County Integrated Development Plan acknowledges that the proximity of Kiambu County to the City of Nairobi has seen transformation of large pieces of land into residential properties. Further, that the presence of good all weather roads have given an opportunity to those working in Nairobi to reside within the County. This has led to the establishment of numerous mixed use developments such as Buffalo Hills and Golf Village by Kamuthi Housing in Kilimambogo, Migaa by Home Afrika Ltd and Tatu City where thousands of previously arable land is being turned into housing estates. Others include "City Edge" by Kiambu based Urithi Housing Co-operative Society, Thika Green, Juja South and Bahati Ridge.

A plausible explanation for these developments is because there has been an increased interest in the affordable lifestyle offered by these developments. People want to live in high-income residential estates such as those coming up in Nairobi, but are prohibited by the cost as these are almost three times higher than developments in the outskirts of the City. At the national level, the annual housing demand is currently at 200,000 units against a supply of 50,000. The deficit is further compounded by the diminishing land resource that has also seen prices soaring over the last decade. This has seen market players urging developers to consider a high density approach and bigger plot ratios to make optimal use of available land. Residential densities proposed in RedCoral will respond albeit on a micro-scale.

On the industrial and commercial front, Nairobi has consistently grown in significance as an investment, transport and financial center in the greater East African community region. There are many multinationals and NGOs that have either set up their operations or plan to relocate to Nairobi, in addition to fast- growing domestic Kenyan businesses. The City is also ranked fifth out of seven African cities that made it to a list of 120 most competitive global cities in benchmarking the future competitiveness of cities (Economist Intelligence Unit, 2013). This global interest and domestic growth can only create a higher demand for new industrial and commercial developments, and the proposed RedCoral development has been designed with this in mind.

8.2 Kiambu County Draft Spatial Development Plan

The RedCoral Masterplan ties in with the Draft Kiambu County Spatial Development Plan – currently awaiting approval by the Kiambu County Assembly. The Spatial Plan categorizes the RedCoral site as a peri-urban zone where developments of the proposed nature are acceptable. The County Government has also approved a change of use from agricultural to mixed use (residential bungalows, maisonettes and flats, educational, commercial, light industrial, recreational and other public facilities)

8.3 Nairobi Metro 2030 Strategy

The Vision of Nairobi is to be a world class African metropolis by 2030. It will strive to create a world class working environment with a wide range of jobs, transport options and communication infrastructure. It is a vision of a world class living environment with modern housing, healthcare, cultural amenities and recreational facilities. Nairobi intends to provide high-quality office, production and storage space supported by a full range of ancillary services and information infrastructure (Shanghai Manual:A Guide for Sustainable Urban Development, 2010)

The Nairobi 2030 plan intends to achieve its vision through a range of integrated initiatives that address the challenges that currently hinder urban development and social progress. Central to the city's plan on improving its international economic competitiveness is the development of regional and global service hubs for business, trade and finance. In addition to attractive foreign investment through a thriving business economy, the plan also supports the continued development of Nairobi's tourism sector through investments in hotel facilities, transportation access and crime prevention. The plan also intends to spur the development of industrial parks and facilities within the city as well.

The plan outlines the development of a transport master plan to effectively improve transportation infrastructure and land use planning to improve existing transportation options around the city. Focusing on improvement of the existing road network, the plan also details an urban mass transit strategy that centers around investments in high occupancy buses and modernization of the existing commuter rail network. By improving the city's accessibility to mass transportation, the city can effectively reduce road congestion and increase commuter access to the city center, while improving public health at the same time.

The RedCoral Masterplan ties in with the Nairobi Metro 2030 Strategy in various ways such as in the development of commercial and industrial facilities with potential to become a business hub. The proposed railway station is also in line with the government strategy of metropolitan railway network development. The government seeks to enhance rail transport which is more convenient, faster, safer and cost effective reducing the time and resources spent in commuter transport, freight and maintenance of roads. The proposed station will also fit well within the Nairobi Commuter Rail Service which is an initiative that sets out to give Nairobi Metropolitan and its environs a mass transit rail system transforming mobility of the city dwellers; majority of whom are dependent on public transport. Stations that have been developed so far include the Makadara, Imara Daima and Syokimau Railway Stations. Others proposed include Kikuyu, JKIA, Thika, Ruiru and Athi River Railway Stations.

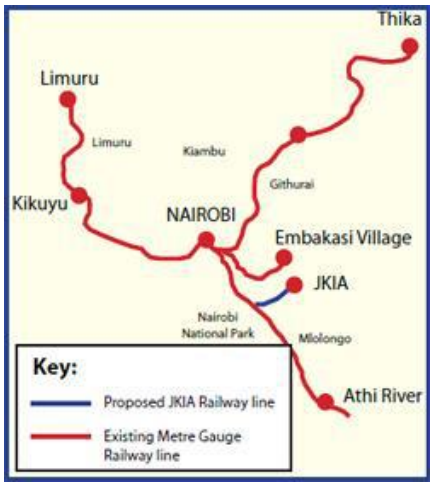


Figure 2: Proposed Commuter Train Routes for Nairobi. Source: (Global Village Partnerships, 2014)

8.4 Catchment Management Strategy (2009 – 2014) – Athi Catchment Area

The Catchment Management Strategy (CMS) is a tool for a planned and systematic management of water and related catchment resources with the participation of stakeholders. The vision of Athi Catchment Area in management of water resources is "to be a prudent manager of water catchment areas, addressing scarcity and quality for all in the Athi catchment area". This underscores water adequacy in line with the national Vision 2030. It calls for the Athi catchment area to conserve the catchment to ensure access to adequate quantity and quality water for all.

The five goals that Athi catchment area sought to achieve within five years of implementation of the strategy included:

- Sustainable water management which includes the enhancement and protection of natural flow regimes and improvement of water quality;
- Enabling environment to protect the water ecosystem and habitat;
- Equitable water allocation which promotes effective use and gives priority to the maintenance of Reserve;

- Collaboration between WRMA and all stakeholders to achieve sustainable water resource management in the catchment;
- Development of adequate and safe water resources infrastructure to meet the water security needs of region.

The operationalization of the strategy is dependent on the assets and strengths of the region one of which includes the Kikuyu Springs and whose catchment includes Limuru where RedCoral is located. Targets developed under the water allocation and water use management plan in the strategy included ensuring that:

- Water abstraction permit system in place to ensure lawful water use;
- Water allocated is used sustainably, rationally and economically amongst competing users taking a pro-poor approach;
- Increased volume of recycled water used in the catchment;
- An allocation criteria for equitable utilization of water in the catchment developed;
- Designed comprehensive operational plans for harmonizing abstraction records;
- Effective metering, monitoring and compliance is in place;
- Identify areas and level of over-allocation and forestall over-allocation.

In line with these targets, RedCoral has carried out hydrogeological studies to establish the ground water potential of the site, planned the development within the limits of the available water resources, and maximized on recycling/reuse in operations. Before abstraction of ground water, permits will be sought from the relevant Authority (WRMA).

8.5 Vision 2030

The vision is a national long-term development blue-print to create a globally competitive and prosperous nation with a high quality of life by 2030. The vision aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The vision is anchored on three key pillars; economic, social and political governance.

The Economic Pillar of Vision 2030 seeks to improve the prosperity of all regions of the country and all Kenyans by achieving a 10% Gross Domestic Product (GDP) growth rate by 2012. Under this pillar, one of the vision goals in the manufacturing sector include the development of Small and Microenterprise (SME) Parks to harness international commerce opportunities.

The Redcoral Plan supports this goal by provision of a light industrial zone within the plan. Commercial areas within the plan can also be developed into wholesale hubs to enhance trade and improve the supply chain of small operator retail markets.

On the social pillar, the vision seeks to invest in the people of Kenya in order to improve the quality of life for all Kenyans by targeting a cross-section of human and social welfare projects and programmes. This is through:

- Education: provision of education facilities
- Health: provision of adequately equipped health facilities
- Environment: preparation of a waste management strategy and establishment of a waste management system; promotion of sustainable land use through preparation of a national spatial plan
- Housing: provision of 200,000 housing units annually;
- Labor and employment: Development and implementation of a national occupational safety and health policy that provides focused strategies for occupational safety and health in order to improve the work environment in terms of safety procedures and measures and enhance productivity.

The Redcoral Masterplan lends support to the social pillar through the allocation of spaces for educational and health facilities, development of an integrated waste management strategy to cater for solid waste and

effluent that will be generated in proposed developments; and provision of serviced residential neighborhoods to meet the growing housing demands. Occupational/public health and safety measures will also be instituted and enforced during plan implementation to safeguard life and provide a safe working/living environment.

9. Recommendations

9.1 Recommended Plan Changes

The RedCoral Development planning process has entailed consultations with various authorities with jurisdiction for infrastructure and services in the area, and the community in order to arrive at an optimal plan for development. Over a one-year period, various structure plan options casting different scenarios (totaling up to 5) have been considered before agreement on the current structure plan (option 5). Recommendations therefore entail measures to enhance the suitability of the Structure Plan Option 5.

9.2 Recommended Mitigation Measures

9.2.1 Traffic and Transport

To ensure that the vehicular traffic increase from construction and operation phase activities do not cause nuisance or hazards, development and implementation of a Traffic Management plan to ensure safety, prevention of traffic snarl ups and congestion will be required. For management of construction traffic, the appointed contractor(s) should ensure that construction traffic movement does not coincide with the known rush hours in the plan area, and that speed loading limits are observed. Further, he/they should set up warning signs along the roads near the site warning other motorists of the potential hazards created by construction vehicles while turning into or out of the site. In general, the contractor(s) should aim at minimizing vehicle numbers and movements as much as practicable. Traffic management principles will also be applicable to manage traffic in the operation phase of the development.

9.2.2 Water Resources

Water is a scarce resource in Rironi area and shall require conservative use of the available water, and protection of water sources from pollution. Conservation measures during construction shall in the first place include raising of awareness among workers, and inclusion of measures to reduce, re-use and recover water during the construction process. Measures for protection of the water resource should include institution of spill control measures for potential pollutants such as oils solvents, paints etc. to prevent their entry into the local watercourses or ground water

To conserve and protect water resources during operation phases of the development, measures such as rainwater harvesting, treatment and recycling of effluent and use of low-volume fixtures in the households should be implemented. A public awareness program should also be established and sustained to inform residents of the need to conserve water

9.2.3 Energy Resources

Fossil fuel and grid energy use have the impacts of off-site and onsite emission of oxides of carbon, nitrogen and sulphur (in generators and other combustion engines), and depletion of the fossil fuel resource. In view of these impacts, the appointed Contractor(s) should select plant, materials and construction methods that minimize the requirement for energy. Where this is not possible, measures such as maintenance of equipment and machinery to manufacturers' specifications by regular servicing to maintain efficiency in combustion and reduce carbon emissions should be done. The use of environmentally friendly fuels such as low sulphur diesel reduction of idling time for machinery should also be encouraged.

To ensure efficient energy consumption, energy saving technologies (mainly applied in the choice of electrical appliances) and management strategies should be applied in project operations. Energy use should be monitored with an aim of identifying opportunities for savings. Alternative sources of energy such as

solar and wind energy should be exploited since the area experiences relatively high wind speeds and plenty of sunshine. Other measures that can be incorporated in the designs that have implications on energy conservation include properly sized windows to allow maximum natural light entry, and reduce artificial lighting requirements.

9.2.4 Soils and Geology

Potential adverse impacts on soils and geology of the site can arise from carting away of spoil, spillage of chemicals and other substances causing soil pollution, importation of soil in landscaping, or from soil erosion. As such, measures for prevention of soil pollution (such as spill prevention/control, and management of concrete washout) prevention of soil erosion and measures to reduce soil exportation/importation (such as balancing cut and fill activities, and use of local soil resources in landscaping) should be implemented.

9.2.5 Biodiversity and nature conservation

The proposed site and the surroundings, due to the existing vegetation cover, forms good habitats and forage grounds for birds, small mammals and herpertofauna. Loss of vegetation cover at the site will lead to a loss of biodiversity, habitat and forage grounds for these wildlife. It was however noted that the vegetation cover to the north eastern part of the plot is mostly comprised of exotic *Acacia mearnsii* tree stands with invasive tendencies and having recently colonized the fallow land possibly after a bushfire incident(s). Clearing of these tree stand and replacement with indigenous vegetation will enhance local plant diversity possibly also attracting other faunal species. An elaborate management plan to reduce and or control the spread of *A. mearnsii* should be developed. The cleared *A. mearnsii* tree stands should be replaced with indigenous vegetation. Other vegetation management measures include ensuring minimal clearance of vegetation during construction, and re-vegetation of cleared areas with indigenous vegetation as much as possible.

9.2.6 Air quality

The local air quality is likely to be adversely affected by both construction and operation phase activities such as earthworks, vehicle movements and use of machinery/equipment such as generators and incinerator(s). Management of dust through measures such as the use of dust screens and sprinkling of active construction areas will be necessary. Proper maintenance of vehicles and machinery will reduce emission of flue gases while control of open burning and incineration will also reduce emission of gases and particulate matter into the atmosphere.

9.2.7 Noise and vibrations

Likely sources of noise and vibrations include general construction activities such as in the use of tools, generators, compressors and vehicles. This noise can be managed through noise-suppression techniques such as in the use of portable hoods to shield compressors and other noisy equipment where possible. Noise reduction can also be achieved through sensitization and behavior change in the construction workforce.

9.2.8 Health and safety

The health and safety of both the public and workers is paramount in any activity/venture. Construction sites pose health and safety hazards through creation of unsafe conditions, poor work methods and in the use of unsafe tools/equipment. As a minimum, site Occupational Health and Safety rules and regulations need to be formulated and implemented in order to reduce accidents and hazards involving or posed to workers. Personal Protective Equipment and sanitary facilities should be provided for all workers to ensure their health and safety. Proper management of the interface between the construction site/vehicles/equipment and the general public is required to reduce hazards and accidents involving the

public. This can be minimized through controlling access to the active construction sites by hoarding and posting warning signs in hazard prone areas. Health and safety can also be improved during operations through a continuous process of identification of risk areas, development of risk management plans and sensitization programs.

9.2.9 Waste

The RedCoral Development is likely to generate significant waste during construction and operation phases. This is of significance because the area does not have adequate facilities for the management of both solid and liquid waste. To manage construction waste, measures to reuse, recycle and recover should be implemented as much as possible to ensure that materials that would otherwise be disposed-off as waste are diverted for productive uses, or used as inert fill material. Measures to ensure that construction material requirements are carefully budgeted and that no construction materials are left on site after construction should also be implemented.

An integrated waste management strategy is required during the operation phase of the development. The strategy should entail measures for reduction at source, re-use/recycling composting, incineration and proper disposal in designated areas.

Storm water and effluent to be generated during operation phase of the development should be recycled and utilized as much as possible within the site.

9.3 Trade –Offs

From stakeholder consultations, there have been community concerns on the potential impacts of the proposed development on the local water resources, waste management scenario, and security situation. Questions that have been asked are such as:

- Will there be water enough for everyone in twenty years if Redcoral abstracts water from the 8 boreholes proposed?
- Will Redcoral share water from its boreholes when the community boreholes dry up?
- Can Redcoral assist in the management of waste in the area such as in sharing of their proposed incinerator to dispose waste from the surrounding community?
- How will the new population from the development be integrated with the existing community?
- How will Redcoral support the neighboring communities and Institutions such as Gatimu Primary School?

To address concerns on the scarce water resources in the locality, Redcoral will abstract ground water at levels lower than the allowable maximum limits. In addition, the development will maximize on rainwater harvesting, treatment and recycling of effluent, ground water recharge and other water conservation measures in facilities/buildings. These measures will serve to safeguard the available water resources and ensure their sustainable utilization.

During implementation of the planned development, Redcoral will incorporate a management company called TiLiSi. Under TiLiSi, a Corporate Social Responsibility Programme will be established to address emergent community concerns and promote harmonious co-existence between the host community and the proposed development. The CSR Programme will be mandated to identify concerns and opportunities for collaboration with the community in finding solutions to issues pertaining to neighborhood.

9.4 Need for subsequent EIAs for the Plans

The proposed RedCoral Development will be implemented in Phases beginning with development of the Light industrial and residential Precincts. Thereafter, other facilities and precincts will be implemented progressively. Before development of each Phase, an Environmental Impact Assessment of the Projects proposed will be carried out in conformity with the provisions of the Environmental Management and Coordination Act, 1999.

10. Environmental Management and Monitoring Plan

10.1 Overview

The measures presented in this Chapter summarizes the key impacts identified and the remedial measures, the actions to be taken by various parties and the monitoring activities. An indication of the timing for implementation and the cost involved is also provided. The EMMP tables can be further expanded with documented procedures and guidelines for work practices so as to be as responsive to the situations that various Contract Parties will encounter. Implementation of the EMMP shall be done within the provisions of the law and for the ultimate benefit of the stakeholders in the Plan area. The effectiveness of the EMMP shall be monitored and assessed regularly through inspections and reporting throughout Phase development and during operations.

10.2 Construction environmental management and monitoring plans

A Construction Environmental Management and Monitoring Plan (CEMMP) is a practical and achievable plan of management to ensure that any environmental impacts during the design, planning and construction phase are minimized. CEMMP's have been proposed to deal with the following issues during construction of the various projects in the development:

- Physical setting, flora and fauna;
- Noise and vibrations;
- Water resources;
- Energy resources;
- Air quality;
- Traffic Management;
- Waste management; and
- Occupational health and safety.

10.3 Contractor Environmental Management Plan

The contractors appointed for the construction of the development must develop their own EMPs to ensure actions and mitigation necessary to protect the environment are incorporated into all site procedures. At a minimum, a contractor's EMP must address the following:

- Policy
- Planning
- Implementation and Operation

10.3.1 Policy

The contractor will develop an environmental policy that includes, as a minimum, the following:

- A commitment to comply with applicable regulations and other requirements that the company subscribes to;
- A commitment to provide a safe work environment;
- A commitment to provide the training and equipment necessary to for employees to conduct their work safely;
- A commitment to continuously improve performance and to pollution prevention;
- A commitment to communicate the policy to all persons working for and on behalf of the company;

10.3.2 Planning

Environmental issues and the legal and other requirements for the development have been identified in the SEA. These shall be further expounded in subsequent EIAs for the various projects within the development. The Contractor must demonstrate within his plan that he has read and understood the SEA and EIA Reports and their provisions for environmental management and monitoring.

10.3.3 Implementation and Operation

Roles, responsibilities and authorities should be defined, documented and communicated to ensure effective environmental and social management. A specific management representative should be assigned that is responsible for ensuring that the EMP is established, implemented and maintained and is responsible for reporting performance, reviewing the Plan and making recommendations for improvement. Documented confirmation is required that the training needs of all persons working for or on the company's behalf whose work pose significant hazards to their health and safety and / or may create a significant impact on the environment has been identified. Records of all training must be maintained.

Management, Supervisory, and Employee responsibilities must be communicated to all employees through training, formal job descriptions, work experience, hiring practices, etc. Awareness training should be provided that includes the importance of conforming to the policy and procedures, the significant environmental, and the roles and responsibilities of management and staff.

Records shall be legible, identifiable and traceable to the activity. Records shall be stored and maintained in such a way that they are retrievable and protected against damage, deterioration or loss.

The contractor will establish, implement and maintain procedures to identify potential emergency situations and potential accidents that can have an impact on the environment, surrounding communities, the employees, and / or the public.

The contractor should be prepared to respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental or social impacts. The EMP must also address how the contractor will receive, document and respond to external interested parties.

10.4 Environmental Monitor

An independent Environmental Monitor will be identified and contracted to perform the following:

- Verify that all project approvals and permits are in place prior to the start of construction;
- Evaluate contractor plans (e.g., EMP, Spill Response and Waste Management) and monitor implementation;
- Develop inspection checklists to ensure site inspections are focused and useful
- Conduct environmental monitoring of construction works; the environmental monitor will ensure the protection of the environment, that mitigation measures are appropriately implemented and to facilitate communication between the Contractor, the Project Team and NEMA; and
- Prepare regular written reports to the Project Team, Contractor and, where need be, NEMA on an agreed to schedule.

Detailed CEMMP's are presented below.

Table 12: CEMMP - Physical setting and biodiversity

Objective	Maintain the existing balance in the physical and biological components that exist in the Project area.			
Management strategy	Provide for appropriate measures that guarantee the protection of the physical and biological environment			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Maintain as much as possible the natural drainage systems and patterns; ▪ Where possible, begin landscaping activities as soon as construction begins; and ▪ Set out a landscape plan for re-vegetation of disturbed areas, and prioritize indigenous trees and shrubs in the choice of plants	Contractor/Proponent	Planning. Design & construction& Occupation	These will be part of preliminary contractor costs.
Performance indicators	▪ Status of completed sections previously disturbed during clearance/construction	Contractor/Proponent	Construction Phase	
Monitoring requirements	▪ Periodical inspection	Contractor/Proponent	Construction Phase	
Reporting	A landscape plan; Site log book	Proponents/Contractor	Construction Phase	
Interface	Compliance with the EMMP and with the EMCA, 1999	Contractor	Construction Phase	

Table 13: CEMMP - Energy resource management

Objective	Minimize impact on energy resources due to the construction works			
Management strategy	Conserve energy resources			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Ensure the use of rated equipment in welding and related works; ▪ Maintain equipment and machinery to manufacturers' specifications by regular servicing to maintain efficiency in combustion and reduce carbon emissions; ▪ Use environmentally friendly fuels such as low sulphur diesel; and ▪ Minimise the period for machinery idling to save on fuel	Contractor	Construction phase	These will be part of preliminary contractor costs.
Performance indicators	Evidence of energy conservation measures instituted and functional at the site;	Contractor	Construction phase	
Monitoring requirements	Physical inspection	Contractor	Construction phase	
Reporting	Site activities log book.	Consultant	Construction phase	
Interface	Comply with international best practices	Contractor	Construction phase	

Table 14: CEMMP - Air quality

Objective	Maintain the air quality by avoiding air pollution			
Management strategy	Abate pollution of the atmosphere by reducing emissions			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Sprinkle water on work areas, and materials heaps to minimise dust emissions; ▪ Maintain equipment and machinery to manufacturers' specifications by regular servicing to maintain efficiency in combustion and reduce carbon emissions; ▪ Use environmentally friendly fuels such as low sulphur diesel; ▪ Minimise the period for machinery idling; ▪ Ensure that no burning of waste is done on site; and ▪ Provide appropriate Personnel Protective Equipment such as dust masks to site workers.	Contractor	Construction phase	Part of preliminary contractor costs.
Performance indicators	▪ Lack of complaints / Complaints; ▪ Results of air quality measurements; and ▪ Reports / Log book entries.	Proponent	Construction phase	
Monitoring requirements	▪ Physical inspection; ▪ Air quality measurements if necessary; and ▪ Site Log books	Consultant	Construction phase	
Reporting	Site logs of inspections and corrective actions.	Contractor	Construction phase	
Interface	Review and comply with relevant laws and regulations on air quality control	Contractor	Construction phase	

Table 15: CEMMP - Noise and Vibrations

Objective	Maintain low noise levels and reduce vibrations emanating from construction activities			
Management strategy	Prevention of noise pollution and vibrations			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Install portable hoods to shield compressors and other small stationary equipment where necessary; ▪ Endeavour to use equipment installed with noise abatement devices as much as practicable; ▪ Reduce idling time on trucks and other noisy equipment ▪ Encourage drivers to turn off vehicle engines when not in use; ▪ Provide personal protective equipment such as ear muffs to workers at the site as necessary; and ▪ Carry out construction work during the day only.	Contractor	Construction phase	Part of preliminary contractor costs.
Performance indicators	▪ Complaints; and ▪ Reports / Log book entries.	Proponent	Construction phase	
Monitoring requirements	▪ Physical inspection ▪ Site Log books	Consultant	Construction phase	
Reporting	Site logs of inspections and corrective actions.	Contractor	Construction phase	
Interface	Review and comply with relevant laws and regulations on Noise pollution and vibrations	Contractor	Construction phase	

Table 16: CEMMP - Soil resource management

Objective	Protection of soil resources at the site			
Management strategy	Prevention of depletion of the soil resource at the site			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Use excavated soil to create buffers and berms during the site's landscaping activities; ▪ Identify fertile soil borrow-pits as close as possible to the project site; ▪ Ensure re-vegetation of disturbed areas as soon as possible to prevent soil erosion; ▪ Ensure that construction vehicles use predetermined tracks at the site to reduce ground compaction; ▪ Construction wastewater shall be channelled to a predetermined area such as a temporary holding pond where sedimentation can take place and reduce the amount of soil carried away in wastewater; ▪ Oils, fuels, paints and any hazardous materials to be stored in accordance with their respective MSDS's, and in such a manner to avoid spillages or leakages. Bund walls should be constructed around these substances' storage area so as to enable containment in the event of spillage or leakage; and ▪ Implement erosion and sedimentation controls and ensure proper disposal of liquid waste	Contractor	Construction phase	Other activities will be part of preliminary contractor costs.
Performance indicators	▪ Level of soil erosion observed at the site; and ▪ Quantity of excavated soil carted away/re-used at the site	Proponent	Construction phase	
Monitoring requirements	▪ Physical inspection ▪ Site Log books	Consultant	Construction phase	
Reporting	Site logs of inspections and corrective actions.	Contractor	Construction phase	
Interface	Review and comply with relevant laws and regulations on protection of soil resources	Contractor	Construction phase	

Table 17: CEMMP - Water resource management

Objective	Protection of water resources in the area			
Management strategy	Conservative use of water at the site and prevention of water pollution by activities at the site			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Measures for protection of soil erosion shall also apply; ▪ Ensure that water is used efficiently by avoiding extravagant water use and wastage; ▪ Seek approvals from the relevant authority before abstraction of ground water; ▪ Monitor water consumption and maintain records; ▪ Harvest storm water wherever possible to supplement other sources of water; ▪ Establish silt fences or channel construction wastewater into sediment traps which are temporary holding ponds to allow sedimentation before release into the environment; ▪ Recycle and reuse construction wastewater wherever possible;	Contractor	Construction phase	Part of preliminary contractor costs
Performance indicators	▪ Water consumption levels , water pollution incidences or practices that could cause water pollution	Proponent	Construction phase	
Monitoring requirements	▪ Physical inspection ▪ Site Log books	Consultant	Construction phase	
Reporting	Site logs of inspections and corrective actions.	Contractor	Construction phase	
Interface	Review and comply with relevant laws and regulations on protection of soil and water resources	Contractor	Construction phase	

Table 18: CEMMP - Traffic management

Objective	Prevention of traffic nuisance by construction vehicles			
Management strategy	Develop and observe traffic management plans			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Contractor shall ensure that construction vehicles do not cause nuisance to the general public through obstructions, and that speed limits are observed; ▪ Develop a traffic management plan to ensure that site vehicles do not interfere with the regular traffic along A104, C62 and D378 Roads, or pose safety hazards to site workers or the general public; and ▪ Set up traffic control/warning signs near the site informing other motorists of potential hazards ▪ Advance discussions with Kenya Railways to make the railway station a reality for the development	Contractor	Construction phase	Part of preliminary contractor costs
Performance indicators	▪ Complaints/ number of accidents/incidences	Proponent	Construction phase	
Monitoring requirements	▪ Physical inspection ▪ Site Log books	Consultant	Construction phase	
Reporting	Site logs of inspections and corrective actions.	Contractor	Construction phase	
Interface	Review and comply with the relevant laws and regulations regarding traffic management	Contractor	Construction phase	

Table 19: CEMMP - Health and safety

Objective	Ensure a safe working environment at the site			
Management strategy	Provide proper safety equipment, facilities and conditions that will eliminate or reduce the risk to the workers and all those present therein.			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Comply with the OSHA 2007 and all other relevant regulations governing health and safety at workplaces; ▪ Access to the active construction sites shall be controlled by hoarding the construction sites and posting warning signs to the general public; ▪ Provide for appropriate signage and warnings in work areas; ▪ Provide appropriate personnel protective equipment (PPE) to site workers; ▪ Provide for First Aid facilities, and ensure that workers are trained on emergency response such as first aid skills; ▪ Provide and clearly display emergency contacts on site; ▪ Provide for adequate sanitary facilities such as latrines and wash water; and ▪ Develop and implement a detailed and site specific Emergency Response Plan.	Contractor	Construction phase	Part of preliminary contractor costs
Performance indicators	▪ Health and safety awareness among workers; and ▪ Frequency of incidents/accidents and fatalities.	Contractor	Construction phase	
Monitoring requirements	▪ Daily inspection of work areas; and ▪ Tool box meetings.	Health and Safety Advisor	Construction phase	
Reporting	▪ Log incidents/accidents and fatalities; and ▪ Tool box minutes.	Contractor	Construction phase	
Interface	Compliance with regulations on health and safety at the workplace	Contractor	Construction phase	

Table 20: CEMMP - Raw materials management

Objective	Conservation of natural resources			
Management strategy	Conservative use of raw materials			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Source construction materials such as sand, murram, aggregate, and hard core from registered and approved quarries and sand mining firms; ▪ Implement stringent inventory management mechanisms and only order for materials after a fairly accurate estimation of construction requirements; and ▪ Manufacture building elements off-site where possible, and deliver to site.	Contractor	Construction phase	Part of preliminary contractor costs
Performance indicators	▪ Compliant/licensed of raw material suppliers	Contractor	Construction phase	
Monitoring requirements	▪ Annual inspection of licenses	Consultant	Construction phase	
Reporting	▪ Annual audit report	Consultant	Construction phase	
Interface	Compliance with the relevant regulations on mining and quarry extraction, and international best practice	Contractor	Construction phase	

Table 21: CEMMP - Solid waste management

Objective	Prevention of pollution from wastes generated at the site			
Management strategy	Ensure wastes generated are adequately disposed off			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Identify a temporary holding area for construction wastes; ▪ Recycle and re-use construction waste as much as possible; ▪ Ensure that all non-recyclable/reusable wastes are cleared from site at the earliest opportunity to avoid pile-up; ▪ Ensure that cleared waste is disposed appropriately in designated disposal/landfill sites; ▪ Establish measures to ensure that construction material requirements are carefully budgeted to avoid leftovers; and ▪ Ensure the use of durable, long-lasting materials that will not need to be replaced often, thus reduce the amount of construction waste generated over time.	Contractor	Construction phase	Part of preliminary contractor costs
Performance indicators	▪ Waste management plans at the site ▪ Site status	Contractor	Construction phase	
Monitoring requirements	▪ Periodical inspection of the site to establish adequacy of waste management plans in place	Consultant	Construction phase	
Reporting	▪ Periodical audit reports	Consultant	Construction phase	
Interface	Compliance with the provisions of the Waste Management Regulations on waste management	Contractor	Construction phase	

10.5 Operations phase environmental management and monitoring plans

The Operational Environmental Management and Monitoring Plan (OEMMP) focuses on sound environmental management practices that will be undertaken to minimize adverse impacts on the environment through normal operation of a development. The OEMP further identifies what measures should be taken in the event of emergencies or incidents during the operation of the RedCoral Development. OEMMP's have been proposed to deal with the following issues during operation:

- Water and Energy management;
- Noise and vibrations;
- Waste Management; and
- Occupational health and safety.

To effectively implement the mitigation measures and monitor the environmental and social performance of the development in operation, the Proponent through the development's Management Company shall appoint qualified resources carry out the following:

- Develop and update the various management plans for solid waste, traffic, effluent, health and safety energy, and community;
- Carry out environmental, health and safety and social monitoring by carrying out the statutory audits and periodic inspection of the facilities/operations;
- Applying for the necessary environmental, health and safety or other approvals as necessary.

Detailed OEMMP's are presented below.

Table 22: OEMMP - Waste management

Objective	Eliminate impact on public health due to the poor waste management on location			
Management strategy	Removal of agents of environmental pollution and proper disposal of wastes			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Pursue waste minimisation at source principles e.g. zero generation, reduction, re-use and/or recycling; ▪ Provide mechanisms to segregate wastes at source, ensure that all wastes are stored temporarily at the designated transfer stations, and that they are regularly carried away for disposal in designated areas; and ▪ Ensure regular inspection and maintenance of foul water drainage works and the wastewater treatment plants at the premises to prevent clogging, and fore-stall breakdowns.	Proponent	Operations	Cost of waste collection and disposal systems to be determined in the detailed planning for each phase of the development Inspection and maintenance costs to be established at operations phase.
Performance indicators	▪ Housekeeping, littering, and status of drainage works and wastewater treatment plants.	Proponent	Operations phase	
Monitoring requirements	Periodical inspection	Proponent	Operations Phase	
Reporting	Environmental Audits and other Statutory and non-statutory reports	Proponent	Operations Phase	
Interface	Comply with the provisions of the Waste management Regulations on Waste management	Proponent	-	

Table 23: OEMMP - Water and Energy Management

Objective	Minimize impact on energy and water resource within the plan area due to the operation of the Proposed Development			
Management strategy	Conserve energy and water resources through lowering the consumption levels in the development			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	**Water Management** ▪ Incorporate water accounting systems and metering for all areas; ▪ Encourage all stakeholders in RedCoral to conserve water through awareness programs; ▪ Install and maintain low volume fixtures in toilets, baths and other wet areas; ▪ Where applicable, Use recycled and harvested storm water in cleaning and irrigation of lawns; and ▪ Continually seek new avenues for water conservation as international best practices evolve. **Energy Management** ▪ Encourage staff and other establishments within the development to conserve energy through awareness programs; ▪ Install and maintain energy efficient appliances e.g. indoor lights and outdoor security lights; and ▪ Continually seek avenues for energy conservation as international best practices evolve	Proponent	Operations	Cost of water and energy efficient fixtures and appliances will be part of project costs Cost of water and energy monitoring including viable conservation measures to be determined and procured at prevailing rates during operations
Performance indicators	▪ Changes in water and energy consumption levels	Proponent	Operation	
Monitoring requirements	Develop a monitoring and evaluation schedule.	Proponent	Operation	
Reporting	Logs of inspections and corrective actions.	Proponent	Operation	
Interface	Compliance with existing laws/regulations on energy and water conservation, and international best practices	Proponent	-	

Table 24: OEMMP - Air quality, and noise

Objective	Manage activities to reduce impacts of air pollution and noise on the surrounding			
Management strategy	Ensure implementation of a air pollution and noise monitoring and prevention mechanisms			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Ensure the regular maintenance of generators and the incinerator at the site to maintain a high combustion efficiency ▪ Ensure the continual planting and maintenance of vegetation to act as carbon sinks at the site; ▪ Carry out noise and vibration monitoring and mapping as will be found appropriate; and ▪ Maintenance of vegetation on site that attenuates noise within the development	Proponent	Operations	Costs of maintenance of generators and incinerator and noise monitoring to be determined and procured at prevailing rates during operations -
Performance indicators	Noise levels at the site from identified point sources	Proponent	Operation	
Monitoring requirements	▪ Complains; and ▪ Periodic measurements	Proponent	Operations	
Reporting	Complaints / incidents should be recorded in a log book on location.	Proponent	Operations	
Interface	Comply with international best practices in noise management	Proponent	Operation	

Table 25: OEMMP - Public and occupational health and safety

Objective	Minimize risks of harm and injury to all stakeholders in RedCoral			
Management strategy	Provide proper safety equipment, facilities and conditions that will eliminate or minimize risks			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Comply with the requirements of the ILO code of practice for safety in workplaces; ▪ Provide for the appropriate signage and warnings in potential risk areas; ▪ Provide appropriate Personnel Protective Equipment (PPE) to maintenance staff at the premises where applicable; and ▪ Develop and implement detailed and site specific emergency response plans	Proponent	Operations	Cost of signage and warnings in hazard prone areas shall be included in the respective facilities installation costs: Additional safety measures/features to be procured at prevailing rates during operations
Performance indicators	▪ Health and safety awareness among stakeholders in the development; and ▪ Frequency of incidents/accidents and fatalities.	Proponent	Operations	
Monitoring requirements	▪ Daily inspection of work sites; and ▪ Tool box meetings.	Proponent	Operations	
Reporting	▪ Log incidents/accidents; and ▪ Prepare tool box minutes.	Proponent	Operations	
Interface	Ensure compliance with the relevant laws on safety in workplaces and other international best practices	Proponent	-	

Table 26: Traffic Management

Objective	Ensure the smooth flow of traffic and minimize risks of accidents			
Management strategy	Continually monitor traffic incidences, establish their root cause and provide solutions			
	Activities	**Responsibility**	**Timing**	**Costs**
Actions	▪ Develop and maintain a traffic management plan that caters for vehicular and pedestrian traffic associated with the development	Proponent	Operations	Cost of signage and warnings in hazard prone areas and other infrastructure shall be included in the project costs during construction: Additional safety measures/features to be procured at prevailing rates during operations
Performance indicators	▪ Traffic incidents related to the development	Proponent	Operations	
Monitoring requirements	▪ Periodic inspection of traffic management facilities.	Proponent	Operations	
Reporting	▪ Incidence logging.	Proponent	Operations	
Interface	Compliance with international best practices	Proponent	-	

11. Consultation and Grievance Redress Mechanisms

11.1 Overview

Stakeholder consultations and grievance redress are important actions that ensure acceptance, support and the successful implementation of any PPP or project by any PAPs. Effective and strategically aligned stakeholder engagement can have impacts such as:

- Lead to more equitable and sustainable social development by giving those who have a right to be heard the opportunity to be considered in decision-making processes;
- Enable better management of risk and reputation;
- Allow for the pooling of resources (knowledge, people, money and technology) to solve problems and reach objectives that cannot be reached by single organizations;
- Enable understanding of the complex business environment, including market developments and identification of new strategic opportunities;
- Enable corporations to learn from stakeholders, resulting in product and process improvements;
- Inform, educate and influence stakeholders and the business environment to improve their decision-making and actions that impact on the developer(s) and on society;
- Build trust between developer(s) and stakeholders;

Stakeholders who have been identified as PAPs include neighboring residents and institutions; a community-based organization; various arms of the Kiambu County Government; National Government bodies governing roads and water resources in the area (KeNHA, KeRRA and WRMA); and other utility companies.

During implementation of the Masterplan, Redcoral will incorporate a management company, TiLiSi, which will be responsible for management of the development and shall be the interface between the developer and stakeholders.

11.2 Mechanisms for engagement

The stakeholder consultation process will be based on the overarching principle of inclusivity. This will entail a commitment by TiLiSi – the development's management company, to reflect at all stages of the process, the views and needs of all Stakeholder groups. Stakeholder views will be obtained through an engagement process that allows them to be expressed without fear or restriction (AccountAbility, 2005).

Inclusivity will be achieved by adherence to the following three principles:

- Materiality: this requires knowledge of what concerns are important to TiLiSi and to the stakeholders;
- Completeness: requires understanding of the development's impact and the perceptions/expectations of the stakeholders; and
- Responsiveness: requires coherently responding to stakeholders' and the organization's material issues

Various approaches will be used in stakeholder engagement. The approach will depend on factors such as:

- The development's strategic engagement objectives;
- The current approach to and level of engagement with the stakeholders;
- The maturity of the issue;
- TiLiSi and the stakeholders' expectations regarding the outcomes of the engagement;

- Available resources to undertake engagements; and
- The magnitude of change that TiLiSi is seeking and the margins of movement

Such approaches shall include:

Information: this is where the goal shall be to inform or educate the stakeholders and shall take the form of bulletins/letters/brochures, speeches/public presentations or advertisements.

Consultation: where the goal is to gain information and feedback from stakeholders to inform decisions made internally. This shall entail surveys, focus groups, one-to-one meetings, public meetings and workshops.

Involvement: where the goal is to work directly with stakeholders to ensure that their concerns are fully understood and considered in decision making. This will be achieved through multi-stakeholder forums, advisory panels, consensus building processes and participatory decision- making processes.

11.3 Grievance Redress Mechanisms

A key element in the success of the engagement process is the development and implementation of a grievance mechanism. The grievance mechanism will be scaled to fit the level of risks and impacts of the Masterplan and will flow from TiLiSi's broader process of stakeholder engagement and business integrity principles, and integrate the various approaches of engagement.

Grievance procedures will be established by TiLiSi and agreed with the stakeholders. These will be published and explained to the relevant stakeholder groups. The procedures will enable the stakeholders and (especially the community) to lodge complaints or concerns, without cost, and with the assurance of a timely and satisfactory resolution of the issue(s). The procedures will be in place from the beginning of the social and environmental assessment process and exist throughout construction and operations through to the end of project life.

As with the broader process of stakeholder engagement, the management will be continually informed and involved so that decisive action can be taken when needed to avoid escalation of disputes (IFC, 2007). A resource with community liaison skills will be employed by TiLiSi and who will also be the contact person in order to personalize the relationship between the development and the community. This will create an informal atmosphere in which grievances can be aired and sorted out, or referred up the chain of command.

The Grievance procedures will not replace the existing legal process but will seek to resolve issues quickly without resulting to expensive and time-consuming legal actions.

The grievance redress mechanism will have established timeframes within which to respond to all recorded complaints. The response time will be enforced to allay frustration by letting people know when they can expect to receive a response to their complaint. This shall be combined with a transparent process by which stakeholders can understand how decisions are reached in order to inspire confidence in the system.

Records of all complaints shall be kept in a log or database. The record shall contain the name of the individual or organization; the date and nature of the complaint; any follow-up actions taken; the final result; and how and when this decision was communicated to the complainant. To prevent any perceived intimidation of complainants and therefore marginal success of the mechanism, any complainant uncomfortable with diverging overly personal data will be allowed to lodge their complaint.

12. Technical Appendices

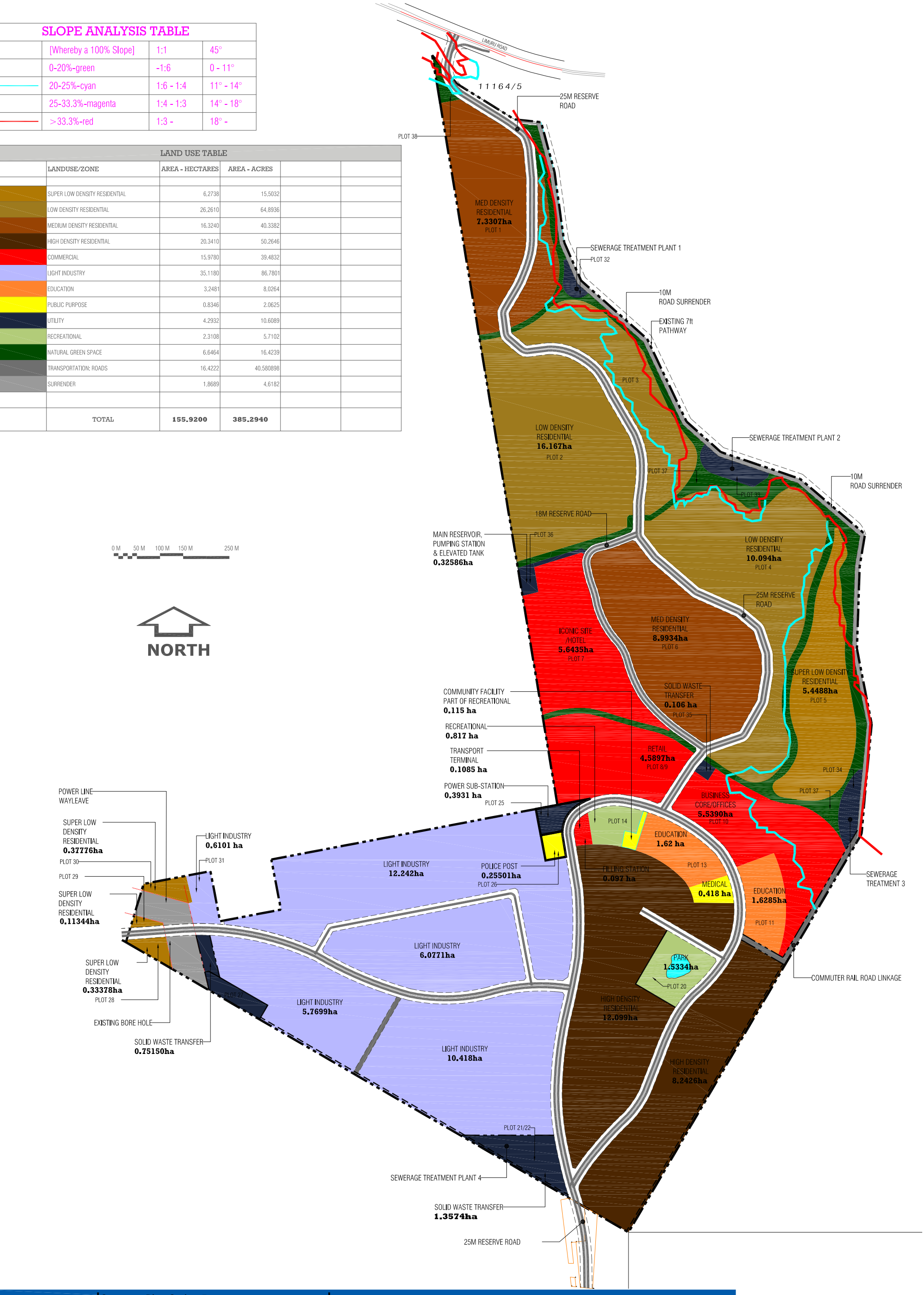
12.1 Structure Plan-Option 5

SLOPE ANALYSIS TABLE

	[Whereby a 100% Slope]	1:1	45°
	0-20%-green	-1:6	0 - 11°
	20-25%-cyan	1:6 - 1:4	11° - 14°
	25-33.3%-magenta	1:4 - 1:3	14° - 18°
	>33.3%-red	1:3 -	18° -

LAND USE TABLE

	LANDUSE/ZONE	AREA - HECTARES	AREA - ACRES		
	SUPER LOW DENSITY RESIDENTIAL	6.2738	15.5032		
	LOW DENSITY RESIDENTIAL	26.2610	64.8936		
	MEDIUM DENSITY RESIDENTIAL	16.3240	40.3382		
	HIGH DENSITY RESIDENTIAL	20.3410	50.2646		
	COMMERCIAL	15.9780	39.4832		
	LIGHT INDUSTRY	35.1180	86.7801		
	EDUCATION	3.2481	8.0264		
	PUBLIC PURPOSE	0.8346	2.0625		
	UTILITY	4.2932	10.6089		
	RECREATIONAL	2.3108	5.7102		
	NATURAL GREEN SPACE	6.6464	16.4239		
	TRANSPORTATION: ROADS	16.4222	40.580898		
	SURRENDER	1.8689	4.6182		
	TOTAL	**155.9200**	**385.2940**		



P-10 | Structure Plan Option 5 | 1:5000 | Red Coral - Limuru / Structure Planning - Option 5

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12.2 Minutes of stakeholder meetings

Howard Humphreys (East Africa) Limited
Consulting Engineers

MINUTES OF THE RED CORAL MASTERPLAN SEA VALIDATION WORKSHOP

Minutes of Meeting

SUBJECT: Red Coral Masterplan SEA Validation Workshop
HELD AT: James Gichuru Lounge, Sigona Golf Club

DATE & TIME: 24th February 2015 from 9.45am to 4.00pm

REFERENCE: 10442K/4/LWN/003

In attendance:

Signed attendance sheet attached.

Absent with apology:

1. Hon. Eng. John Chege Kiragu - Member of Parliament, Limuru Constituency.

Absent:

1.	Eunice Karoki	Ministry of Planning, Kiambu County
2.	William Kabogo	Kiambu County Governor
3.	Peter K. Supeyo	Water Resources Management Authority(WRMA)
4.	Eng. Charles Obuon	Kenya National Highways Authority(KeNHA)
5.	Eng. Kivanguli	Kenya Urban Roads Authority(KURA)
6.	Eng. Mengich	Kenya Railways Corporation
7.	Margaret Maina	Limuru Water & Sewerage Company(LIWASECO)
8.	Simon Ng'ang'a	Broadcast Solutions International

AGENDA

1. Reporting to venue, registration and opening prayer
2. Opening Remarks by NEMA, Area Chief, Member of County Assembly, and Assistant County Commissioner
3. NEMA Presentation on the Strategic Environmental Assessment(SEA) Process
4. Presentation of the revised Draft SEA Report by the Howard Humphreys SEA Team
5. Plenary Discussions and Closing Remarks

Abbreviations

A: Answer;
ACC: Assistant County Commissioner
CO: Comment;
CSR: Corporate Social Responsibility
EIA: Environmental Impact Assessment;
EMCA: Environmental Management and Coordination Act
EMP: Environmental Management Plan
KeNHA: Kenya National Highways Authority
KeRRA: Kenya Rural Roads Authority
KURA: Kenya Urban Roads Authority
LIWASECO: Limuru Water and Sewerage Company
MCA: Member of County Assembly;

NEMA: National Environment Management Authority
PPP: Plan, Policy Programme
Q: Question;
RE: Response;
SEA: Strategic Environmental Assessment
SIDA: Swedish International Development Cooperation Agency
TORs: Terms of Reference.
WRMA: Water Resource Management Authority

Minutes of the workshop

Minute 1: The meeting commenced at 9.45am with a word of prayer led by Archbishop Njoroge.

Minute 2: Opening remarks and introductions

Simon Wandeto welcomed everyone to the meeting and invited all to introduce themselves.

1. ***John Kamau Mwaura: Senior Chief Rironi***: He welcomed all to the meeting and the project area and invited the senior assistant county commissioner to the stage.
2. ***Joseph Murugami: MCA, Limuru Central***: In his remarks, he mentioned that he had been informed of the planned development from the initial stages and was well aware of the issues involved. He further commended the developers and offered his and the community's support to the development saying it would lead to growth and development in the area.
3. ***Lawrence Omondi: Assistant County Commissioner, Limuru***: The ACC welcomed all to Rironi, and thanked the Proponent for engaging all the project stakeholders throughout the SEA cycle.

   He further appreciated the plan saying that it was expected to improve local infrastructure and offer the local people employment opportunities.

   He delivered the apologies of Mr. David Kiprop-the Deputy County Commissioner.
4. ***Ann Macharia: Compliance and Enforcement Department, Office of the Director General-NEMA***: The officer explained that the SEA department was undergoing capacity building with the help of SIDA-NIRAS and the government of Sweden.

   She further reported that the process was guided by the EMCA (1999), and that any project under schedule two is supposed to undergo an Environmental Impact Assessment (EIA).

   She also mentioned that there are different ways of carrying out a Strategic Environmental Assessment (SEA); Ex ante assessment and Ex post assessment. For the Red Coral case, the Proponent opted to develop the plan in parallel with the SEA process.

   She explained that the validation workshop was meant to check the SEA report for acceptability with the stakeholders. She further noted that if one validation workshop was sufficient for the Plan, then NEMA would present the Proponent an approval letter. Otherwise, it is possible for a plan to undergo more than one validation workshop if stakeholders raise major issues in the first one.

Minute 3: NEMA Presentation on the Strategic Environmental Assessment (SEA) Process by Veronica W. Maina: the Compliance and Enforcement Officer, SEA Section-NEMA.

The Officer took the participants through the SEA process as follows:

1. Introduction
   a) Strategic Environmental Assessment (SEA) is a decision making tool that is used to integrate environmental considerations into policies, plans and programmes (PPP) thereby contributing to sustainable development
   b) SEA informs the interested and affected parties on the sustainability of strategic decisions, identifies best alternatives and ensures democratic decision making
   c) A good SEA must be :- Integrated , lead to sustainability, focused, accountable, participatory and interactive
2. Why carry out a Strategic Environmental Assessment?
   a) It helps improve strategic actions- By appraising them and influencing the kind of projects undertaken
   b) It promotes sustainable development- SEA improves planning and helps meet social and economic needs within environmental capacity,

c) It analyses alternatives when options are still open and comes up with the best option

d) It promotes and ensures wider consultations leading to change in attitudes and perceptions and,

e) Helps address the limitations of EIA.

3. Steps in the SEA Process

a) Screening

- This involves submission of the plan brief by the owner to NEMA.
- The brief is screened within 7 days to determine whether a SEA is required.
- The following issues are taken into consideration when screening:-
  - ✓ Whether the impacts are significant and cumulative in nature
  - ✓ The Plan is politically or publicly contentious
  - ✓ Gaps and inherent uncertainties in predicting the effects of the Plan
  - ✓ Risks to health, safety and /or integrity of social or ecological systems
  - ✓ Existing levels of environmental quality
  - ✓ Whether the plan will result in major changes

She further explained that the Plan brief for the Red Coral Development master plan was submitted on 16th April, 2014 and reviewed by NEMA. Red Coral Properties Limited was then advised to subject the master plan to Strategic Environmental Assessment.

b) Scoping

Veronica pointed out that the (PPP)owner engages environmental experts to carry out the scoping study explaining that the following activities are involved:

- Identifying the SEA objectives
- Defining the boundaries in terms of space , time and subject matter
- Identifying and engaging stakeholders
- Identifying possible effects on people and the environment
- Identifying issues/problems to be studied in detail
- Identifying reasonable alternatives
- Analysing the policy and legal framework
- Establishing links/contradictions with existing plans and policies and
- Preparing the scoping report which includes the TORs.

She pointed out that the Red Coral Scoping report was submitted on 30th May, 2014 and approved by NEMA.

c) Detailed SEA study

Veronica explained that this stage involves a detailed study of the issues identified during the scoping phase and activities carried out under this study include:

- Collecting baseline information
- Situation analysis and predicting trends
- Identifying and predicting impacts and evaluating significance
- Comparing alternatives, identifying measures to enhance opportunities and mitigate adverse impacts and
- Preparation of the draft SEA report.

Veronica reported that the Red Coral draft SEA Study report was received by NEMA on 30th September, 2014.

d) SEA review

Under this stage, the NEMA official reported that the draft SEA report is subjected to different reviews as follows:

- Administrative review by NEMA- the Authority reviews the draft SEA report to determine whether it's adequate to be subjected to stakeholder review.
- Stakeholder review- NEMA sends draft SEA report to stakeholders to submit their comments. Red Coral draft SEA report sent to stakeholders on 04th October, 2014.
- Public Review- A notice is put in the Kenya Gazette and the newspapers inviting the public to submit their comments. The Red Coral notice was put on the 20th & 27th November (Standard newspapers) and 21st & 28th November (Kenya gazette)

Veronica pointed out that the comments submitted both by stakeholders and the general public are incorporated into the corrected Draft SEA report.

e) SEA validation

At this stage, the NEMA official explained that the plan owner (in consultation with NEMA) organizes a validation workshop to engage the public and stakeholders in reviewing and validating the corrected SEA report.

Comments arising from the validation workshop are incorporated into the corrected draft SEA report and the final SEA report submitted to NEMA within 60 days.

She highlighted that this was the agenda of the 24th February 2015 validation workshop, and that the workshop legally marks the end of the disclosure period.

f) Decision Making, Monitoring and Evaluation

She further explained that NEMA approves the finalized SEA by issuing an approval with conditions.

She also pointed out that Red Coral Properties Limited would be responsible for the monitoring and submission of reports to NEMA and that NEMA shall oversee the implementation process for quality assurance.

She concluded by pointing out that the SEA process is intended to ensure that the Plan leads to sustainable development, meeting the economic and social needs within the environmental capacity.

Minute 4: Presentation of the corrected Draft SEA Report by the Howard Humphreys SEA Team.

Simon Wandeto presented the corrected Draft SEA report as follows:

1. **Plan Proponent:** He described Red Coral Properties Limited (to change to TiliSi): as the developer, stating that he possesses 387 acres of land in Rironi and had purchased several additional parcels of land to facilitate access to the property.
2. **The Plan:** Simon explained that the Plan entails development of housing, commercial (offices) and light industrial (warehouses) and infrastructure services, whose aim is to provide a quality environment (pleasant, clean and safe) for living, work and play with the cognition that there is high demand for housing in Nairobi Metropolitan region and need for easy access to services such as these.
3. **Precincts:** He further pointed out that the development would have the following precincts:

   a. Residential (173 acres)

   - super low - 4 units per acre
   - Low – 8 units per acre

- Medium - 16 units per acre
- high density (flats) - 40 units an acre

b. Light industrial (mainly warehousing); -17 premises 5 acres each

c. Commercial (offices, retail and iconic site) (40 acres).

Other facilities to be included in the Plan he described as educational, water treatment plants, a power substation, a waste transfer site, dedicated parks/fields, green and open spaces, and trunk roads.

4. **Demographics:** Simon reported that demographically, the Plan's population was estimated at 18,000 people with 15,000 being residents (>80%), and (12%) Commercial precincts.
5. **Impact area:** It was reported that the Plan was expected to have varying effects/influence on the following:
   a) The Nairobi Metropolitan Region due to its proximity to the City Centre
   b) The Strategic location along the gateway to the North-Rift and Western Regions of Kenya – potential to influence these regions
   c) The neighboring towns such as Limuru, Kikuyu, Rironi and Tigoni

Overall, the Plan he said, was expected to catalyze commerce, infrastructure development and economic growth of these areas.

6. **Environmental Baseline information:** Simon reported that baseline information (hydrogeology, geology and soils, biodiversity and land uses) had been collected through field studies and references, and the following found out:
   a) **Soils**: They are well drained, extremely deep, dusky red to dark reddish brown friable clay, with acid humic topsoil.
   b) **Surface water**: There are no surface water bodies in the immediate area.
   c) **Vegetation:** The Plan area is 70% grassland with grasses such as *Sporobolus, Cynodon, Cypperus sp* and *Pennisetum sp*., 29% *Acacia mearnsii* (exotic Wattle trees) and 1% *Grevillea robusta* and other indigenous trees.
   d) **Ground water:** This is the most relied upon. Area lays on the boundary of a Ground Water Protection Zone
   e) **Fauna:** There is no large fauna except free ranging cattle. Others include rodents, birds, herperto-fauna (chameleons, frogs, and lizards)

7. The SEA Process

a) SEA-Strategic Environmental Assessment

Simon explained that Strategic Environmental Assessment(SEA) is a family of analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programs (PPPs) and evaluate the inter linkages with economic and social considerations. He further noted that SEAs are needed because they:

a. Integrate environmental, social and economic considerations into strategic decision making
b. Add value by analyzing plans at an early preparatory stage in their formulation and
c. Set the context and framework for EIAs of subsequent projects.

b) Scope and objectives of SEA

On the scope and objectives of the SEA, he reported that the SEA aimed at:

- Identification and assessment at a strategic level the environmental and socio-economic opportunities/constraints of implementing the proposed plan
- Development of strategic level recommendations for addressing the identified limitations as well

as enhancement of opportunities.

- Assessment of alternatives and options that can improve the land use plan; and
- Integration of stakeholders' perspectives into the proposed land use plan and ;
- Provision of information to better integrate environmental considerations into decisions, implementation, and monitoring in order to minimize risks to the plan and risks emanating from the plan.

c) The SEA methodology

Simon explained that:

- The SEA followed the National guidelines for Strategic Environmental Assessment in Kenya, 2012.
- Conformed to with the provisions of the Environmental Management and Coordination Act, 1999 and Environmental (Impact Assessment and Audit) Regulations 2003
- STEP 1: submission of Plan Brief -Submitted to NEMA in April 2014
- STEP 2: Scoping Studies – Scoping Report submitted to NEMA in May 2014
- STEP 3: SEA Study – SEA Draft Report submitted to NEMA in September 2014
- STEP 4: NEMA Internal Review
- STEP 5: Public Disclosure: Media Advertisements and public review (Nov 2014 – Jan 2015)
- STEP 6: Amendment of SEA Draft Report
- STEP 7: Validation Workshop
- STEP 8: Submission of Final SEA Report
- STEP 9: NEMA Review and Decision on SEA Report
- STEP 10: Plan Implementation and monitoring
- Subsequent EIAs on specific Projects

d) Legal, policy administrative provisions reviewed

He further noted that the following had been reviewed:

- The Constitution of Kenya;
- Environmental Management and Coordination Act 1999 and subsidiary Regulations
- The Water Act 2002;
- The Water resource management rules 2007;
- The Public Health Act (Cap 242);
- The Wildlife Conservation and Management Act, 2013;
- The Physical Planning Act, 1996;
- Employment Act 2007;
- Occupational Safety and Health Act, (OSHA) 2007;
- The various Factories and Other Places of Work Rules;
- The Penal Code (Cap. 63)
- Traffic Act Cap 403
- Energy Act, 2006
- The Civil Aviation Act, Cap 394

- The Land Act, No. 6 of 2012
- Land Registration Act No. 3 of 2012
- International Convention on Biological Diversity (1992)
- The World Heritage Convention (1972)
- The Ramsar Convention 1971
- The United Nations Framework Convention on Climate Change.

e) The Planning Process

On this, Simon explained that it entailed the identification and evaluation of various alternatives:

- **Structure plan options 1 – 5** were developed and evaluated. The plan options had different space allocations;
- **Water supply options:** supply from boreholes, supply from LIWASECO, supply from rainwater harvesting, recycling and reuse
- **Power supply options:** various sources (directly from Rironi substation; tap from existing power lines; or from a new substation on the 66kv line traversing the site)
- **Waste management options:** onsite treatment and reuse of treated effluent; treatment and discharge to environment; disposal to LIWASECO's facility
- Water & power supply & waste management options considered in terms of practicality, sufficiency, local impacts and cost.

f) Stakeholder engagement

The Consultant reported that this started early in the planning process and the following had transpired:

- Consultation was carried out with various authorities to establish limits and controls at the beginning of planning
- Stakeholder analysis was also done to identify both community and institutional stakeholders
- The engagement process had been carried out to inform the stakeholders about the Plan and provide opportunities for them to influence decisions.
- The following stakeholders were identified: Neighboring residents, institutions/education centers and commercial establishments; the local authority (Kiambu County Government); The County Administration, government authorities like KeNHA, KURA, KeRRA, NEMA, WRMA and service Providers such as Kenya Power, LIWASECO etc.
- Further, meetings were held with community and institutional stakeholders on the Plan. Community and Institutional stakeholder workshops held on 14th and 19th of August 2014 respectively.
- On the outcomes of the stakeholder engagement exercise, Simon reported that the general perception is that the Plan is acceptable and worthwhile, as it would lead to creation of employment and business opportunities, growth of infrastructure and other services/amenities.
- Comments however were raised over provision of educational facilities to complement the existing schools, a medical center within the Plan and also over the fate of the existing community water supply infrastructure on site. Other concerns included potential nuisance from solid and effluent wastes anticipated from developments, waste management strategy proposed for the Plan, existence and adequacy of a discharge control plan for the development, types of industries to be established within the Plan area and provision of adequate road amenities (road reserves, acceleration/deceleration lanes, and suitable junctions.

g) Prediction and evaluation of impacts

On this, he reported that:

- **Traffic studies** have been carried out on the plan, and there is projected increase in traffic along A 104 Nairobi – Nakuru Road, C62 – Limuru Road, and the D378 Ngecha - Chunga Mali Road. Thus there will be additional requirement for maintenance of these roads. He further pointed out that the railway station proposed would ease commuter and freight traffic.
- **Water resources:** Hydrogeological studies have also been carried out on the plan**,** as well as feasibility studies for Water supply. He reported that the projected water demand for the Plan may affect local ground water resources. Pollution of ground water resources may occur from management of effluent generated; pointing towards the need for proper **t**reatment of effluent, recycling, rainwater harvesting and other conservation measures.
- **Energy resources:** Feasibility studies for power supply have been carried out, and they projected a higher demand for grid energy and fossil fuel to power residential, industrial and commercial developments. He emphasized that energy conservation measures will be required in building design and fixtures/equipment and that opportunities for exploitation of renewable energy (especially solar) exist and should be harnessed.
- **Soil Resources:** local soil resources may be affected from topsoil removal (excavations) erosion, or contamination, and many of the impacts are anticipated during construction phases. Such impacts he mentioned shall be mitigated through pollution control (spill prevention/control measures), erosion control measures and landscaping initiatives.
- **Biodiversity:** A high level biodiversity assessment has been carried out, and the Plan area is mostly grassland with the northern sections having exotic species tree cover. He reported that vegetation forms good habitats and forage grounds for birds, small mammals and herpertofauna, and that the development is likely to have positive impacts on woody vegetation cover from landscaping activities. This he mentioned is expected to add to diversity of birds and insects.
- **Air quality:** Ambient air quality is likely to be compromised during construction phase and that air pollution prevention measures shall be required during construction. Ambient air quality after development is not expected to change significantly; it may actually be enhanced from more woody vegetation. No heavy air-polluting industries to be located there.
- **Noise and vibrations:** Nuisance is expected to be temporal (mainly during construction phases) but noise management measures will be implemented. Ambient noise levels he explained were expected to be elevated permanently from day to day activities.
- **Health and safety:** health and safety hazards anticipated were mainly from construction activities (both on site and off site mainly from construction traffic interactions with workers and the public). He however pointed out that Health and safety plans would be implemented by contractors, and design of roads and junctions done to enhance public safety.
- **Waste management:** Waste generation and disposal studies had been carried out for the plan, and an integrated solid waste management plan proposed for implementation entailing reduction at source, segregation, recycling, incineration and landfilling. Additionally, effluent would be treated to standards and recycled for irrigation, cleaning etc.
- **Local economy:** The Plan was anticipated to increase employment and business opportunities due to increase in population as well as benefit the local community both during construction stages and its lifetime.
- **Linkages with other plans:** It was reported that the Red Coral Plan was linked to the following other plans-Kiambu County Integrated Development Plan, the Draft County Spatial Plan**,** the Nairobi Metro 2030 Strategy**,** and the Catchment Management Strategy (2009 – 2014) – Athi Catchment Area, and Vision 2030.

  The Kiambu County Integrated Development Plan: The Plan acknowledges that Kiambu has good infrastructure and is close to Nairobi City, recognizes that Kiambu is attracting developments of the nature proposed and the Plan embraces these developments but within controls.

  Draft Kiambu County Spatial Plan: The Plan is currently awaiting approval by the KCA, and it recognizes the site as a peri-urban area where such developments are accepted. In addition,

Planning Authorities have approved a change of user from agricultural to mixed use.

The Nairobi Metro 2030 Strategy: The vision of Nairobi is to be a world class African metropolis by 2030 and to provide high-quality office, residential, production and storage space and other facilities. The Strategy intends to spur the development of industrial parks and facilities within the city and it outlines development of a transport Master plan enhancing mass transit through modernization of the existing commuter rail network among others. The Red Coral Plan ties in through development of commercial and industrial facilities with potential to become a business hub. The proposed railway station is also in line with the government strategy of metropolitan railway network development.

Catchment Management Strategy (2009 – 2014) – Athi Catchment Area: The CMS is a tool for a planned and systematic management of water and related catchment resources with the participation of stakeholders.

The vision of Athi Catchment Area in management of water resources is "to be a prudent manager of water catchment areas, addressing scarcity and quality for all in the Athi catchment area". Its goals are to protect and enhance water resources in Athi Catchment area

Strategy includes protection of assets such as Kikuyu Springs whose catchment includes RedCoral area, and RedCoral is supposed to apply for abstraction permits and ensure water conservation.

Vision 2030: The Redcoral Masterplan is in line with and supports several pillars of Vision 2030 such as :

- Economic Pillar: In Development of SME Industrial Parks
- Social Pillar: Improvement of health and education facilities/services; Environment - Management of Waste and Spatial Planning; and Housing -Provision of 200,000 Units annually

Consultation and Grievance Redress Mechanisms

He further reported that stakeholder consultation and grievance redress are important and ensure acceptance, support and the successful implementation of any Plan; as engagement builds trust between the developer and stakeholders and enables better management of risk and reputation.

Mechanisms for engagement

Additionally, he mentioned that several approaches are to be used as follows:

Information: the goal is to inform or educate the stakeholders and can be through bulletins/letters/brochures, speeches/public presentations or advertisements.

Consultation: the goal is to gain information and feedback from stakeholders to inform decisions made internally. This shall entail surveys, focus groups, one-to-one meetings, public meetings and workshops.

Involvement: goal is to work directly with stakeholders to ensure that their concerns are fully understood and considered in decision making. To be achieved through multi-stakeholder forums, advisory panels, consensus building processes and participatory decision- making processes.

Grievance Redress Mechanisms

On this, Simon explained that grievance procedures will be established by RedCoral and agreed with the stakeholders. The procedures will enable the stakeholders and (especially the community) to lodge complaints or concerns, without cost, and with the assurance of a timely and satisfactory resolution of the issue(s). They will however not replace the existing legal process but will seek to resolve issues quickly without resulting to expensive and time-consuming legal actions.

Records of all complaints shall be kept in a log or database and they shall contain name of the individual or organization; the date and nature of the complaint; any follow-up actions taken; the final result; and how and when this decision was communicated to the complainant.

He concluded by pointing out that changes in the Red Coral Plan had been made in consultation

with Authorities and the community, and that impact mitigation measures recommended for the impacts identified earlier (traffic and transport, water and energy resources; soil resources; biodiversity, air quality; health and safety and waste management would be effected. EIAs would be carried out for specific projects in the Plan at a later stage.

Minute 5: Plenary discussions

Q: Salome Ngigi: What is the implementation timeframe for the Red Coral Plan?

A: Cameron Rush: The approximately 400acres of land is estimated to be done within a 10years timeframe.

Q: Salome Ngigi: Will there be separation of solid and effluent wastes from the light industrial and other Plan areas?

A: George Kimathi: Warehousing wastes are the same as domestic wastes, and they will go through the same treatment as wastes from the residential/commercial areas. Warehousing basically refers to storage/logistics parks for storing and distribution.

A: Henry Musangi: Warehouses are essentially go downs or storage facilities associated with for instance sorting processes and/or light assembly. No heavy air pollution or noise pollution is associated with this

Q: Salome Ngigi: When you say light industries, please be specific on what exactly you mean.

A: Cameron Rush: We are at the strategy level, where it's challenging to give the exact specifics but there will be specific plans when specific-project EIAs are done. We typically expect warehousing / logistics. The term Light Industrial is as defined in the Physical Planning Act of 1996

Q: John Mukabi: The SEA report points to approval of 8 boreholes to be sunk by the Proponent. Does this consider the relationship between abstraction rates versus recharge levels?

A: George Kimathi: Hydrogeological studies were done and submitted to WRMA for approval. WRMA agreed with the report and it was approved. Further, abstraction is guided by WRMA regulations thus over-abstraction is not expected during operations.

Q: John Mukabi: Compliance to EMPs by projects in Kenya is an issue: and air pollution and infrastructural maintenance challenges as a result of increased vehicular movement are rampant. What will NEMA do to ensure compliance to EMPs by Red Coral?

A: Cameron Rush: The developer will take a more proactive approach in assisting NEMA to ensure compliance. Waste disposal for instance will only be done by a NEMA-approved waste disposal agent.

Q: Joseph Wagema: In your integrated waste management plan, will you also be assisting the local community in matters waste disposal?

A: Cameron Rush: Currently the waste management plan only covers TiLiSi. However discussions with the immediate community about this may be considered.

Q: Joseph Wagema: Don't you think over abstraction may lead to water shortages?

A: George Muriithi: Over abstraction not anticipated as the whole process is guided by WRMA guidelines.

Q: Rev. E. Waigi: Where will the dumpsite be located?

A: Cameron Rush: Separation of refuse will happen at source, and recyclables will be recycled. The remaining waste will be taken to a NEMA approved landfill. The Proponent is going to provide an incinerator, and International Bet Practises will be followed.

Q: Rev. Njoroge: How do you intend to handle security issues?

A: Simon Wandeto: There is provision for a police post in the Plan, and grievance redress mechanisms will be applied in addressing any security issues or otherwise from the community.

Q: Rev. E. Waigi: Are you erecting a perimeter wall? If yes, of which material?

A: Ranee Nanji: Yes it will be there but we haven't decided on the type yet. There will also be three

entrances into TiLiSi that people can walk into freely.

Q: James Gathage: What type of light industries are you proposing? It's not clear in the report and these should be defined.

A: Simon Wandeto: Light industries will mainly warehousing and logistics establishments.

CO: James Gathage: We received the SEA report late thus we weren't able to read through the report thoroughly.

CO: James Gathage: After infrastructural development, ensure a legal framework is clearly stipulated so that after TiLiSi there is compliance to development controls.

RE: Jessica Mwenje: We are at the design stage but when buying in, buyers will receive documents that have conditions that will govern the TiLiSi development. The legal framework will cover among other things the Property Owners Association and the developer who will enforce development conditions. It will also include the Lease document binding the lesee to permitted uses and environmental management of the property. This will be a controlled development meaning there will be controls on the design, height, plot ratio etc.

Q: James Gathage: Could we have a draft lease document in the SEA report?

A: Jessica Mwenje: The SEA report does not contain the lease document because it's a document that will be used particularly between the buyer and the developer.

CO: Veronica Maina: It would be good to have a copy of the lease document in the final SEA report so that people see how it will look like.

A: Cameron Rush: Given that the SEA is a strategic level document, it may not be possible to include a lease as its form has not been finalised. The lease will however include all conditions set for development when finalised

Q: Rev. Njoroge: Will public utilities be surrendered to the County government for development?

A: Ranee Nanji: These will not be surrendered to the County Government. However, 89acres of land has been set aside for public space/utilities following conditions given by the County Government Planning Department, and an approval has been given on this.

Q: Veronica Maina: Will the 89 acres be surrendered to the community?

A: Jessica Mwenje: Public land will not be surrendered but will be set-aside for development of public amenities only.

CO: Salome Ngigi: The law requires that the developers surrender 10% of their total acreage for public utility. This has been done by Red Coral, and a more detailed plan will be presented for this at a later stage.

CO: Cameron Rush: Detailed plans will come in later after the SEA. Project-specific EIAs will be done, and there will be opportunities for further input from neighbours on specific EIAs.

CO: Veronica Maina: Referred participants to SEA NEMA guidelines page 35, section 4.2.5.2 and insisted that trade-offs must feature in the report.

Q: John Mugwe: Has the development factored in cemetery/cremation areas for the population that will come with the development?

A: Salome Ngigi: The constitution provides for public participation and public/private partnerships. In deciding on the cemetery, the Proponent must consider what is available in Rironi first.

Q: John Mugwe: What criteria were used in prioritisation of public utilities?

A: Simon Wandeto: TiLiSi will have a CSR programme that will take care of multifaceted community concerns including their priorities, water and others that might have been missed out at this stage.

CO: John Mugwe: i) Water abstraction for the Rironi community boreholes is 400m3 but you are proposing 1600m3, can you specify the recharge rates for the area in the SEA report? ii) Integration of the Red Coral Plan with the local community is not possible because the plan is targeting a different class of

people. iii) Kamandura area residents were not consulted in the process. iv) The public utility land should host facilities that the local community currently doesn't have. In Limuru for instance, we are missing a park.

CO: Cameron Rush: The local community will be able to access TiLiSi, the amenities and services to be established.

CO: George Kimathi: As explained earlier, the quantity to be abstracted is governed by recharge of acquifers, and Red Coral was given a 60% limit by WRMA

Q: John Mugwe: How sustainable is the abstraction? We do not have water at the Manguo swamp. Will we have water in 20years to come?

A: George Kimathi: The Proponent has come up with water management strategies such as rain water harvesting which already reduce consumption from 1600m3 to 1200m3. The planned lagoons will also help with infiltration and ground water recharge.

CO: Henry Musangi: Rain harvesting has been made mandatory in the residential precincts to further reinforce this.

Q: Rev. E. Waigi: Would you amalgamate the 4 acres allocated for educational use with the existing Gatimu primary school for easier management?

A: Simon Wandeto: The possibility of amalgamation of the land allocated for educational use and Gatimu primary school's existing land cannot be confirmed at this juncture.

Q: Rev. E. Waigi: Expaund more on your drainage system.

A: George Kimathi: Five locations have been identified for this and modern technology waste water treatment plants will be used. The lagoons are designed such that there is no overflow to neighbouring areas. The lagoons also allow for recharging of ground water. LIWASECO is also being consulted on disposal of sludge from the treatment plants.

Q: Hannah Njoroge: You have covered environmental, social and economic welfare in the SEA report, how does the Proponent plan to take care of spiritual growth for the Plan?

A: Henry Musangi: The development is designed such that it takes care of the holistic needs of the residents. Although a church is not provided for, scenic views, walkways, recreational areas will cater for spiritual, emotional and physical needs of the population.

CO: Francis Kagia: Donate at least two acres to Gatimu Primary School for extension of their playground.

CO: Simon Wandeto: TiLiSi's CSR programme will seek to address any concerns that the neighbouring institutions and residents may have. The CSR programme will explore ways to assist Gatimu Primary School.

Q: Ms. Waweru: This is the third consultation forum we are having for this project. Has this project been approved by NEMA already, or will there be another forum where experts can get back to the community about the issues we are raising?

A: Simon Wandeto: NEMA is here as an observer who is checking the issues being raised and how the Proponent has addressed or will address them. No approvals have been given on the Plan and NEMA will review all issues and concerns raised before giving approval

CO: Eng. Peter Mwangi: Immediate neighbours were not sufficiently consulted, and also, water abstraction is a concern. Mr. Kinyanjui who shares a boundary with Red Coral was not consulted.

A: Kavit Shah: We tried reaching out to Mr. Kinyanjui severally without success. We are however willing to hold discussions with him at the earliest opportunity if a meeting can be arranged.

Q: Eng. Peter Mwangi: How is the SEA Plan going to be enforced?

A: Simon Wandeto: There will be monitoring and periodical inspections by NEMA to ensure compliance to set conditions.

CO: Veronica Maina: Thanked all for their participation in the workshop and explained that the validation workshop marks the end of the disclosure process.

She however requested the SEA study team to give the community one more week to send in any additional comments they may have on the Draft SEA Report. The comments should be received by 6th of March 2015.

She advised the Proponent to ensure proper waste management, and further carry out periodical water quality tests for treated effluent discharged into the environment.

Veronica further appreciated TiLiSi's planned CSR programme saying it was a noble idea.

She further added that if approved, the SEA would be gazetted to make it legally binding. On, project-specific EIAs, she emphasized that these must be done according to EMCA, 1999 and the regulations.

Q: Ms. Waweru: Would you give the community two more weeks to be able to substantively give in their comments on the SEA Report?

A: Ranee Nanji: This is the third consultation meeting we are having, and as mentioned earlier, it marks the end of the disclosure period. The consultation process begun last year and cannot be open ended

A: Veronica Maina: The additional time is just a sign of good will. Therefore lets have 10 calendar days to submit any additional comments-the deadline will be Friday 6th March 2015.

Q: Ms. Waweru: You had mentioned that we can have up to two validation workshops?

A: Ann Macharia: Note that no major concerns have been raised about the Red Coral Master Plan. It's also important to note that not all propositions made are viable, thus there is no need for a second validation workshop.

Anne also mentioned that NEMA would consider in an objective manner, all comments made since not everything requested by the stakeholders is feasible for implementation, given that this is a private development.

Minute 6: Closing Remarks

Simon Wandeto thanked all for their time and participation, and there being no other business, the workshop ended at 3.20pm with a word of prayer.

Minutes Prepared by: ***Lydia Njeru, Sociologist-HHEA Ltd***

Circulation:

- Red Coral Properties Ltd
- HHEA Project team
- Planning Project Management Ltd team
- Planning Systems Ltd team
- Project stakeholders(on request)

Howard Humphreys (East Africa) Limited
Consulting Engineers

10442K: Red Coral SEA Validation Workshop Attendance Sheet					
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MINUTES OF THE RED CORAL-19TH AUGUST 2014 INSTITUTIONAL STAKEHOLDERS MEETING.

Minutes of Meeting

SUBJECT: Red Coral 19th August 2014 Institutional Stakeholders Meeting

HELD AT: James Gichuru Lounge, Sigona Golf Club

DATE & TIME: 19th August 2014 from 9.00am to 1.20pm

REFERENCE: **10442K/4/LWN/002**

In attendance:

1. Lydia Njeru	HHEA Ltd
2. Simon Wandeto	HHEA Ltd
3. David Komen	HHEA Ltd
4. George Muriithi	HHEA Ltd
5. Kennedy Mwangi	HHEA Ltd
6. Daudi Murithi	HHEA Ltd
7. Ranee Nanji	Red Coral Properties
8. Joseph Mukirai	Red Coral Properties
9. Esther Mwaura	Red Coral Properties
10. Lawrence Omondi	Red Coral Properties
11. Khilna Shah	Red Coral Properties
12. Cameron Rush	Planning Project Management Ltd
13. Chris Childs	Planning Project Management Ltd
14. Peter Gikera	Planning Project Management Ltd
15. Henry Musangi	Planning System Services
16. Mumo Musuva	Planning System Services
17. John Kamau	Senior Chief, Rironi location
18. Clara Kahindi	Assistant County Commissioner
19. Jessica Mwenje	MMC Africa Advocates
20. Mucemi Gakuru	Kenya Railways
21. Esther Omulele	MMC Africa Advocates
22. Teresia Mwaura	Limuru Water & Sewerage Company
23. Jane Manasseh	IPPM
24. Charles Kalya	Kenya Power
25. Michael Misola	Kenya Power
26. Beatrice Kanani	NEMA
27. Njoki Mukiri	NEMA

Absent with apology:

1. Arundhatti Willets-SEA Study team leader, HHEA Ltd
2. David Gatimu- Physical Planning, Kiambu County

Absent:

1. Eunice Karoki/A Representative from the Ministry of Planning, Kiambu County.
2. Mr. Okenye/A Representative from the Limuru Municipal Physical Planning Liaison Committee.
3. Mr. Samson Oiro/A Representative from the Water Resources Management Authority-Nairobi Sub-region office.
4. Eng. Obuon/ A Representative from the Kenya National Highways Authority (Mr. Muturi).
5. Eng. Murage/ A Representative from the Kenya Rural Roads Authority (Elijah Mungai).

AGENDA

1. Welcome remarks and introductions
2. Statement of meeting objectives
3. Overview of the Proposed Red Coral Development and discussions
4. Questions/answers session and discussions

Minutes of the meeting

Minute 1: The meeting commenced at 10:30am with a word of prayer led by Engineer David Komen.

Minute 2: Welcome remarks and introductions

Simon Wandeto welcomed everyone to the meeting and invited all to introduce themselves.

Minute 3: Statement of meeting objectives

Simon explained that the meeting was in partial fulfilment of NEMA's requirement for public consultation and participation. He mentioned that Strategic Environment Assessments were a new practice in Kenya, and that NEMA recently launched the SEA guidelines-Latest being version 2012. He emphasized that the meeting was part of the client's effort to comply with EMCA 1999 and other planning regulations, and to ensure the relevant stakeholders are informed, consulted, and their issues discussed and addressed in the planning stage.

He further introduced the SEA team as comprising of: Arudhatti Willets-Team leader & SEA expert, Simon Wandeto-Environmentalist, Lawrence Njue-Environmentalist, Kennedy Kijana-Environmentalist, and Lydia Njeru-Sociologist.

Other team players involved in the project were listed as:

1. Architects/Land Use Planners-Planning Systems Services
2. Project Managers-Planning Project Management
3. Water, Power and Roads Engineers-Howard Humphreys East Africa Ltd
4. Transport Planners-Arup
5. Legal Advisors-MMC Africa
6. Physical Planners-IPPM

Minute 4: Overview of the Proposed Red Coral Development and discussions

a) History of the Client

Ranee Nanji introduced the client as Red Coral Properties who is the owner of the 387acres piece of land in Rironi since April 2013. She described the developers as consisting of a consortium of shareholders many of whom are real estate developers like Phenom Estate in Lang'ata, Sidai estate in Athi River, Greenspan housing and Greenspan Mall in Donholm, and West end Towers on Waiyaki Way.

She explained that Red Coral Properties was bringing Tilisi to Limuru with the intention of introducing planned and controlled development that would provide high standards of infrastructure, great living and working conditions, decongestion in Nairobi, employment, housing and improved infrastructure in and around the development area. The project was also described as one that would bring facilities such as neighbourhood retail centre, schools, medical centre, and recreational spaces to the area.

Ranee further pointed out that Red Coral Properties Ltd had engaged a team from January 2013 to undertake a prefeasibility study and master planning, and that engineers along with the master planners and project managers were currently in the process of completing preliminary engineering designs for the entire site's infrastructure.

She also mentioned that the developers were planning to start on the South side (Phase 1) and the plan was to break-ground on infrastructure in about one year's time. She also explained that Phase 1 would take 3-4 years to complete infrastructure, their own development and plot sales, and that the rest of the project is anticipated to take another 7-8 years.

Lydia Njeru-Q1: What is the meaning of Tilisi?

Ranee Nanji-A: It's the new Development's name that will replace 'Red Coral' and it was coined as follows: Ti-Li-Si; Ti standing for Tigoni, Li standing for Limuru, and Si standing for Sigona.

Simon explained that there was need for the Red Coral development to provide decent housing away from the Nairobi city centre, in keeping with the trend where such sized land parcels are found e.g. Thika Greens, Buffalo springs and Tatu city.

b) Land Use Planning and Architecture

Cameron Rush explained that the project had been progressing through pre-feasibility stage by establishing baseline conditions for buildup of the structure plan that includes**:** Legal, Physical planning and surveying conditions; Land use assessment; Market study; Environmental and ecological assessment; Infrastructure assessment; Hydro-geological surveys and Transport Planning.

He further pointed out that the project was currently in the preliminary engineering design stage and that the developer had already received PPA2 from Kiambu County Government; borehole approvals; and the NEMA SEA process was ongoing.

Henry Musangi proceeded to explain that due consideration and technical expertise had been put in to ensure the project was planned such that it does not cause disturbances if any to the host area. He mentioned that the area's topography among other factors had been considered

and a site review undertaken to ensure the best structure plan options are developed.

Simon further described the existing site characteristics as follows: *Acacia mearnsii* covered the northern sections, while other areas were under grass cover currently used as grazing land.

He also presented the plan scope as follows: Residential-172acres, light industrial-86 acres and commercial (offices, retail, iconic site)-40acres. He named a school, medical facility, water treatment plants, a power substation, waste transfer site, dedicated park, transport interchange petrol station and a police post as other facilities that would be provided.

c) Roads and Hydrology

Engineer Daudi Murithi started by pointing out that there are three main access roads; which are A104, C62 and the Ngecha-Chunga-Mali Road D378. He mentioned that the roads would be designed such as to ensure minimal disturbance to the host community. To ensure road safety and ease of access, the engineer explained that the road design would be as follows:

- North - Junction Layout Type A, with a ghost island to accommodate right turn lane from direction of freeway
- South - Junction Layout Type B, conventional T with NO ghost island
- West – Left in/out only from southbound carriageway of freeway with acceleration/merge and deceleration/diverge lanes.

He also added that a road hierarchy was being developed by the transport planner (Arup) based on traffic surveys/transport Impact Assessment already carried out.

Engineer Kennedy Mwangi followed with a hydrology report. He started by mentioning that a hydrology assessment was currently underway, and that it was likely that the project would have open drains.

He explained that extra surface water runoff would be channelled towards retention ponds or lagoons via well designed vegetated cut off drains. The envisaged number of lagoons for the whole site was five. He finished by showing a diagram of identified catchment areas.

d) Water and Waste

Engineer George Murithi explained that:

Water Supply options available included: LIWASECO (Borehole + Community schemes), Boreholes at Red Coral (8 No. Yield =1,230m^3/day) and 2 boreholes already drilled.

Estimated water Demand was as follows: Total Demand = 1630m^3/day, Potable = 1,209m^3/day (from Boreholes) and Non-Potable = 421m^3/day (rainwater harvesting + Recycling of treated effluent).

He further explained that the proposed Project would require a borehole collector network, elevated tanks at highest point within the property and a distribution network to various precincts.

On waste water management, the engineer stated that the available Options included

LIWASECO's (STW - Oxidation ditch) – pumping would be required, and the capacity of plant cannot handle additional flow. The current flow to the STW is 500m^3/day) and packaged treatment plants at RedCoral (there's limited land to construct ponds within red-coral).

The estimated volume of wastewater to be generated by the development is 1,317m3/day. He also mentioned that the proposed development would have: 5 No sites for packaged treatment plant, holding lagoons within red-coral and an option to recycle for irrigation, flushing of toilets and other outdoor uses. On this, he emphasized that the waste water would be mostly domestic waste which is easily biodegradable. He further explained that treatment at the site would meet standards for recycling and discharge to the environment as required by NEMA.

Regarding solid waste management, Eng. Murithi explained that there was an existing open dump site operated by Limuru municipality. He put the development's projected total solid waste generation at 35 Tonnes/day.

He further described how the proposed development would handle the solid waste stating that there will be a transfer station within Red-coral from where the waste will be collected for disposal. He explained that waste collection will be by Limuru municipal council or other approved waste collectors for eventual disposal to approved dumpsites or landfills. Onsite waste reduction strategies being considered for the development are waste segregation and recycling/re-use at source and incineration.

e) Power demand and supply

Eng. David Komen stated the following as the available power supply options: New substation at Rironi (2x23Mva), Limuru substation (1x23mva & 1x5mva), Ndenderu substation (2x90mva) and creating a new substation from the 66kv line passing the site. He put the total power demand for the development at 44mva.

He explained that the power plans for the proposed development were to have a main substation at the junction of the Light industrial and high density residential, to have transformers for the various load points within the property, to have an 11kv Overhead supply line to link transformers to various precincts with the option of having underground supply also being considered.

Eng. Komen explained that street lighting of about 240No. poles for the site based on the normal traditional lighting was being considered although it will come with running and maintenance costs. As for Solar street lighting, he explained that solar street lighting (about 240No. poles) complete with photo voltaic solar panel and battery was also being considered. For this, he described the capital costs as slightly high but the running costs would be nil.

He presented the power demands for the development as follows:

Light Industrial: Each of these plots to have a maximum supply of 1mva, a transformer of 1.5mva would be used to provide the necessary power requirements and a total load to this light industrial would be about 17000kva, Residential precincts: The total load envisaged for this areas would be about 18000kva, and commercial precincts: This area would take about 5400kva.

As regards telecommunication, he put the reticulation for ICT services provided through

4x200mm diameter ducts linked with manholes at intervals of 30meters, these would run along the road in parallel with the other electrical services and the crossings of any road areas would be protected by concrete surround.

f) The Consultation process

Simon Wandeto explained that the following stakeholders had been consulted in the planning process: NEMA, Kenya Power, WRMA, LIWASECO, Kiambu County Government, Local Community and neighbors, Kenya Railways, KeNHA and KeRRA.

Results of this consultation exercise he mentioned were:

1. Concerns about and education facility, employment for the locals, a medical facility, Rironi water supply infrastructure, sewer and solid waste facilities, felling of trees and pollution from the light industries.

2. Provisions for the mentioned concerns in the project plans included: Approximately 8acres for an education facility, job opportunities during and after construction, approximately 1acre for a medical facility, legal agreement finalized with the Rironi Water Company and an engineering solution is being sought, mitigation measures to be developed to curb pollution and other nuisances.

Simon further pointed out some of the potential environmental and socio-economic impacts from the proposed project as follows:

Positive impacts: Employment opportunities, decongestion of the city**,** creation of business opportunities, enhancement of security**,** improved infrastructure in and around the area**,** more amenities in the area; and providing housing for the larger Nairobi metropolis in a planned development with all services provided.

Adverse impacts: Temporary Construction impacts including: Noise, air pollution, health and safety, traffic management huddles, construction waste management huddles, and increased demand on energy and water resources. Post construction phase impacts including: increased effluent and solid waste generation from the site, increased demand for energy and water resources and cumulative increase in traffic vehicular and pedestrian traffic.

g) Development's Legal component

Esther Omulele of MMC Africa's Advocates started by describing Tilisi as a world class mixed use development on a piece of land measuring around 387 acres of Land in Limuru – Kiambu County that would comprise of; High Density Residential, Medium Density Residential, Low Density Residential, Super Low Density Residential, a hotel, Business Offices, an education facility and Retail facilities. To give the audience a feel of the vision they had of the development, Jessica Mwenje (MMC Africa), presented the below photo, and it resonated very well with the audience.

She explained that Tilisi will be a controlled development in which the end users will be guided on how to bring up their developments and the types of developments to be brought up. This she pointed out will ensure that the value of the project will not be derogated and any investor in the project will get a high return of investment.

The goals of control as presented by Esther were:

- Long-term ownership, operation and maintenance of common areas and amenities.
- Creation and enforcement of community-wide standards of architecture, maintenance, and use.
- Smooth and efficient operation and administration before and after development period.
- Foster an environment for all uses to succeed.
- Maximize marketability, developmental control, flexibility.

She stated that the legal documents available for the development include: the main title in the name of Red Coral Properties Limited, the Master Declaration of Covenants – the Constitution of the Project, the Physical Planning Standards and Sub leases to end users. Additionally, transactional documents like the Letter of Offer, Agreement for Sale and Sub Leases were also available.

Regarding the Development's governance structure, Esther explained that the land shall be divided into Precincts which will be user specific. Each Precinct will thereafter be divided into parcels which shall be sold to the end users. Further, the end users shall develop their respective parcels in accordance with the development guidelines to be provided by Red Coral Properties.

The governance structure was presented as follows:-

i. Property Owners Association

ii. Precinct Property Owners Association

iii. Management Company

iv. Owners

Esther also explained that the Master Declaration (Binding Legal Covenants) is the primary document that sets up the regulatory framework for the Project. This she pointed out that its registered against the title making it binding on all leases and sub-leases issued under the main title. It also gives rights to the POA and to owners of properties that are enforceable covenant, and imposes restrictions, creates easements and imposes obligations including that of paying for common services/amenities.

She presented the scope and key provisions of the Master Declaration as follows:

- **Restrictions**: use, nuisance, parking etc.
- **Easements**: utilities (water pipes, power cables), access roads, construction and maintenance easements.
- **Architectural Controls**: Standards, establishes the architectural control committee (ACC) , responsibilities –the approval process.
- **Allocation of expenses** : cost sharing formulas for common area and common services
- **Establishes the institutions:** POA, PPOA etc.

The Property Owners Association (POA) Esther explained will be established at the Project Level, and its functions will include:

- Strategy and Policy formulation;
- Service charge formulation for managing and maintaining the Common Areas within the Project;
- Receiving the Reversionary Interest; and
- Upon the exit of Red Coral Properties from the Project, the POA shall be in charge and run the affairs of the Project.

The Precinct Property Owners Association(PPOA), Esther mentioned would be mandated with Managing and maintaining the Common Areas within the respective Precinct; Representing the Precinct, its needs and concerns in the Project to the POA, Service charge formulation for Precincts and Precinct Improvements, and all PPOAs shall be shareholders of the POA.

She also pointed out that the Development's Management Company shall be appointed by Red Coral Properties and the POA to undertake the day today maintenance and provide

services within the Project.

As for Options available in structuring large developments, Esther presented the following:

- Sub- division
- Sub - leases
- Comprehensive development on one title

She explained that for Tilisi, Land will be sold as leases and sub-leases, and these will contain addition and more specific covenants (e.g. a commercial area lease will have different terms from a residential lease – on use, restrictions –operating hours, noise etc.) In addition, POA will have power to enforce the Declaration and all covenants in leases – delegates to the Management Company.

Minute 5: Questions/answers session and discussions

Q1-Cameron Rush: Since the Kiambu landfill is almost full, is a new landfill coming along soon in Kiambu County?

A-Njoki Mukiri: Currently there are 5dumpsites in Kiambu county but waste dumped there is usually not sorted.

Negotiations with the Kiambu county government are ongoing. A potential piece of land (8acres) had been identified in Ruiru but someone claimed it and so the matter is in court.

An alternative piece of land has been identified in Ting'ang'a and the EIA for it is ongoing. Currently Kiambu county does not have a landfill, so NEMA recommends integrated waste management for the Red Coral project.

Q2-Njoki Mukiri: How does the developer plan to handle clients who might want to change from the planned land use?

A-Esther Omulele: The developer does not intend to have land use changes but in case it happens, the client will be required to apply for precinct-specific approval.

Q3-Cameron Rush: Would you be aware of any planned upgrade of the Ngecha-Chunga Mali road?

A-Chief John Kamau: The road belongs to the central government: and yes, the road's upgrade is oncoming and surveys have started in preparation for tarmacing.

Q4-Cameron Rush: Is there any strategy that has been taken by Kenya Power regarding supply of power to the Red Coral site? What about the underground/overhead supply options?

A-Michael Misola: Yes, Red Coral has 3power supply options i.e. New substation at Rironi (2x23Mva), Limuru substation (1x23mva & 1x5mva), and Ndenderu substation (2x90mva).

The choice of reticulation is left to the developer.

A-Charles Kalya: Kenya Power supplies to some customers in bulk and then they supply to

their individual customers. The customer supplied in bulk might get a discount in terms of the tariff.

Q5-Ranee Nanji: Who are some of the customers you've supplied to in bulk?

A-Michael Misola: Lake Naivasha Lodge. The customer must however be careful not to overcharge his consumers as they will raise complaints with Kenya Power.

Q6:-Michael Misola: How do you plan to handle traffic with 13,000 residents expected and 6vehicles leaving a gate per minute?

A-Cameron Rush: We've engaged a transport planner-Arup. They have conducted traffic counts and assessment and their traffic management plan will be very useful in mitigating the traffic upsurge concern.

A-Njoki Mukiri: NEMA advises that a concise traffic management plan is developed and implemented to avert climate change.

The meeting ended at 1.20pm with a word of prayer led by Eng. David Komen.

Minutes Prepared by: ***Lydia Njeru***

Circulation:

- Red Coral Properties Ltd
- HHEA Project team
- Planning Project Management Ltd team
- All stakeholders invited to this meeting

REDCORAL PROPERTIES LTD

VISITORS REGISTER - CONFERENCE HELD ON TUESDAY 19 AUGUST 2014 AT SIGONA GOLF CLUB

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REDCORAL PROPERTIES LTD

VISITORS REGISTER - CONFERENCE HELD ON TUESDAY 19 AUGUST 2014 AT SIGONA GOLF CLUB

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28					
29					
30					

MINUTES OF THE RED CORAL-14TH AUGUST 2014 LOCAL STAKEHOLDERS MEETING.

Minutes of Meeting

SUBJECT: Red Coral 14th August 2014 Local Stakeholders Meeting

HELD AT: Gatimu nursery school, Limuru

DATE & TIME: 14th August 2014 from 10.00am to 2.00pm

REFERENCE: **10442K/4/LWN/001**

In attendance:

1. Lydia Njeru	HHEA Ltd
2. Simon Wandeto	HHEA Ltd
3. Arundhatti Willets	HHEA Ltd
4. David Komen	HHEA Ltd
5. George Muriithi	HHEA Ltd
6. Ranee Nanji	Red Coral Properties
7. Junge Mukirai	Red Coral Properties
8. Esther Mwaura	Red Coral Properties
9. Khilna Shah	Red Coral Properties
10. Lawrence Omondi	Red Coral Properties
11. Cameron Rush	Planning Project Management Ltd
12. Chris Childs	Planning Project Management Ltd
13. Peter Gikera	Planning Project Management Ltd
14. Peter Njuguna	Area Assistant chief
15. John Kamau	Area chief
16. Charles Njehu	Rironi chief
17. Rachael Wandati	Kiroe Assistant chief
18. Clara Kahindi	Assistant DCC
19. Njenga Murugami	MCA, Limuru
20. Community members	List of 288 attendees attached

Absent with apology:

1. Engineer John Kiragu Chege- Member of Parliament, Limuru

AGENDA

1. Introductions
2. Statement of meeting objectives and overview of the Proposed Red Coral Development
3. Description of the anticipated impacts
4. Questions/Answers session

Minutes of the meeting

1. The meeting commenced at 10:00am with a word of prayer.

2. Opening remarks followed. They were presented by John Kamau-the area chief and Mr. Murugami, MCA-Limuru Ward. Mr. Murugami explained that:

   a) The stakeholders' meeting was a NEMA requirement and that the local community's participation in it was key.

   b) He welcomed the developers on condition that they do not pollute the now clean Gatimu environment.

   c) He also requested that the developer considers the local community when sourcing for supplies like ballast, stones and human labour.

   d) The best CSR project in the area would be one that assists Gatimu primary school.

   e) The developer should consider providing water to the local community as water supply by the local water company is currently not sufficient.

   f) The stakeholders' meeting was not political and that the community members should appreciate development projects like this one.

3. Introductions led by area chief-Mr. John Kamau:

   a) Peter Njuguna Kariuki-Senior assistant chief, Gatimu sub location.

      He welcomed all to Gatimu sub location.

   b) Charles Njehu-Assistant chief, Rironi.

      He stated that he was proud to be associated with the Red Coral development project.

      Rachael Wandati-Assistant chief, Kiroe.

   c) She stated that she was glad to be involved in the Red Coral development project, and urged the local community to embrace the project so that Gatimu and Rironi areas can grow and move with the rest of the world.

   d) The Red Coral team

      Introduced themselves as consisting of: Mr. Mukirai, Chris Childs, Cameron Rush, Peter Gikera and Ranee Nanji.

   e) Madam Clara-Assistant Deputy County Commissioner

      She welcomed the Red Coral investors to Limuru and urged the community to embrace the project as it was a blessing to have investors in Rironi. She went further to name some of the facilities that would be provided in the development like a school, medical Centre, and a police post. She described the project as beneficial to

the community in terms of providing employment opportunities during construction, bringing more development opportunities in Rironi, opening up Kiambu county to more development and uplifting the living standards of the residents of Gatimu.

f) Mr. Muniu-Chairman, Gatimu nursery & primary school

He welcomed all to Gatimu and urged the developers to prioritise uplifting education standards in the area. He expressed that area residents lived on less than a dollar per day, and that they would appreciate if the developer considered helping the community to expand Gatimu primary school. He further explained that each classroom in the school required 30 desks @sh.4000.

g) Mr. Gachumi

He delivered the apologies of Engineer Kiragu, and thanked the organisers for the stakeholder meeting. He requested RedCoral to support Gatimu primary to become a model school. His request was that while subdividing the their land, RedCoral should consider giving Gatimu primary school between 3-5acres so that in future they have land to construct even a secondary school. Mr. Gachumi also requested the developers not to demolish the community water tanks as water was already an issue in Rironi area.

h) Mr. Mukirai

He reassured all that the water tanks would not be demolished, and that the developer has allocated a portion of land for educational use.

i) Simon Wandeto

Introduced himself as an environmentalist from Howard Humphreys East Africa Limited (HHEA Ltd). He clarified that HHEA Ltd is not NEMA. He went further to introduce the HHEA team including: Arundhatti Willets, David Komen, Lydia Njeru and George Murithi.

Simon described the study as a Strategic Environmental Assessment (SEA). He explained that going forward; all the specific facilities that will be constructed will again go through Environmental Impact Assessments (EIAs).

He stated that the land owners are RedCoral Properties Ltd, and that the 387 acres piece of land was bought in 2013.

He explained that the Strategic Environmental Assessment must be approved by NEMA and that before commencing any development, all local community issues must be aired and addressed so that there is concensus. He also stated that there would be more public engagement forums in future.

He described the project as consisting of:

1. Residential houses-172 acres
2. An iconic hotel

3. Water tanks
4. Business area/offices-40acres
5. A power substation
6. Light industries-92 acres; warehouses with no or minimal environmental pollution
7. 5treatment plants
8. A school
9. Medical centre
10. Petrol station
11. Police post

Simon further explained that:

1. Design would enable connection of the internal access roads to the other existing roads
2. Water supply would not be cut off, and to ensure reliable supply, boreholes will be sunk taking care to ensure that the existent community borehole won't be affected. Hydrogeological surveys have already been done.
3. Housing will include: super low density, low density, medium density and high density residential zones. The total will be a maximum of 3296 units
4. Limuru Water & Sewerage Company had been consulted and stated that the sewerage system available would not be sufficient to serve RedCoral hence the need for treatment plants. Waste segregation will be a requirement at the development.
5. Kenya Power had been consulted to ensure sufficient power supply.
6. Kenya Railways, Kenya National Highways Authority and Water Resources Management Authority had also been consulted.
7. Public engagement will ensure that all are in concensus.

He further pointed out that the project is anticipated to result in impacts such as:

1. Job opportunities-The contractor will be informed by the chief who in the local community is available and what work they can do. Technical people will however be engaged on merit.
2. Business opportunities-Supply of e.g. food stuffs to the RedCoral workforce.
3. Improved security-More people coming to the area, better organisation and a

police post will lead to improved security.

4. Access road-there will be better infrastructural development in the area.
5. Improved education- some land has been allocated for educational use (Mr. Mukirai).
6. Dust, traffic, health & Safety impacts are also expected and all these will be addressed in the Environmental Management Plan.
7. Each constituent Facility within the RedCoral Development will later have a specific EIA and EMP.

4. Questions/Answers Session

a) Reverend Ephraim Waigi

Q: What will happen to the existing community water tanks?

A: For now, the water tanks will not be relocated and the community will not lack water. The water tanks will be incorporated in the RedCoral plans and access to the water tanks will be addressed. The developer is also currently working with Rironi Water and the project engineers towards achievement of a practical solution in the long term for all involved.

b) Mr. Paul Wandati

Q: Would you include the 4acres given to Gatimu primary school in the RedCoral official plans?

A: This has not been decided on yet, but 8acres has been set aside for education.

Recommended that the water tanks be given one acre of land and this be included in the official plans to avoid trespass.

A: A legal relationship is being drawn up between the developer, Rironi Water and other relevant stakeholders to address all issues about the Rironi Water infrastructure.

c) Mr. Kironji Wamae

Recommended that:

i. the Red Coral plans are changed to reflect the RedCoral school and Gatimu primary school together

ii. Garbage be collected and segregated within RedCoral not in or near the community

iii. The District Liaison Committee should approve the waste management plans

Response: Engineered waste transfer sites are provided for in the plans. Segregation will take place, and collection and disposal will be by a NEMA-approved vehicle to

an approved/designated dumpsite.

d) Robert King'ori Nyaga

Recommended that:

i. Waste segregation be done within the RedCoral farm

ii. Water issues should have a community representative and all discussions be properly documented

iii. The community should be involved and consulted as much as possible

iv. Trees planting should be included in the plans.

Responses:

ii) Rironi Water is currently being involved in all discussions concerning the water tanks.

iii) This stakeholder meeting is one of the ways of involving the community in the project.

iv) Planting of trees is covered in the development's landscaping plans.

e) Mr. Ng'ethe Njoroge

Q: What is the meaning of Red Coral:

A: This development by RedCoral Properties Ltd is called TiLiSi meaning Tigoni-Limuru-Sigona.

He stated that he too, is involved in a similar project but his will be called 'Gathoni'. He emphasized the importance of God, explaining that he had donated some of his land for construction of a church.

He requested the developers to advice the local community on how they can best use what they have. He also emphasized the need for planting trees

Mr. Karanja: Requested that a binding agreement be prepared to ensure in case RedCoral changes hands, the community will not have problems especially with the water tanks.

Response: RedCoral has already engaged a legal team to prepare a legal document that will be reviewed and signed by Rironi Water Self Help Project officials.

f) Madam Wanjiku

She recommended that the wastewater lagoons be established far away from the local community. She also requested the developer to make use of local human labour and pay labourers well.

Response: These two recommendations will be considered.

g) Mama Wambui

She requested that the developer considers providing a medical centre as Gatimu area doesn't have a hospital

Response: The development has a provision of land for medical use.

h) Zipporah Njuguna

Q: Is there any documentation on the agreed on issues?

A: Yes, the minutes of this meeting will be available for review by the community representatives.

i) Mama Wangui

Appreciated the development and requested for the community to be given 5acres of land for planting fruits.

Response: The chief mentioned that this was private land thus this is not possible.

j) Mr. Mugwe

Q: As part of CSR, would RedCoral help Rironi in constructing a drainage system?

A: We respect jurisdiction and can only ask the County government whether it can do that drainage system.

k) Mr. Charles

Q: What type of industries are you proposing to construct?

A: only light industries consisting of warehouses.

He recommended that any equipment/machines used in the development should not be noisy.

Q: Can the grassland be given to the local community for pasture before construction starts?

A: The land is not public anymore thus no one will be let in (Area chief).

l) Mr. Wanyoike

Q: When will the project commence?

A: If all goes according to plan: in 2015.

Q: Which projects will the Gatimu community be involved in?

A: The contractor will organise with the local administration to identify where the

opportunities exist.

Q: Can RedCoral work with LIWASECO in rehabilitating the county council's human waste system to produce fertilizer?

A: LIWASECO has been consulted and their current sewer system does not have capacity to accommodate effluent from the project. Jurisdiction must be respected thus developer will leave the rehabilitation to the county council.

m) Christopher Mwangi

Q: Why haven't you invited community members neighbouring the project site to the North to this meeting?

A: Everybody was invited only that Gatimu was chosen because it is central and it is an immediate neighbour to the proposed development.

n) James Mburu

Q: How will the people of Gatimu know that their proposals have been incorporated in the development plans?

A: There will be more meetings and feedback will be given in subsequent stakeholder engagement forums.

o) Arthur Mbugua

Q: What type of fence will the developer put up around the farm?

A: The owners will decide on the type to use (chief).

A: Red Coral is still thinking about it (Simon).

Presentation of a gift to Gatimu nursery school, photo session and vote of thanks.

The meeting ended at 2.00pm with a word of prayer.

Minutes Prepared by: ***Lydia Njeru***

Circulation:
- Red Coral Properties Ltd
- HHEA Project team
- Planning Project Management Ltd team
- Community Representatives: Assistant County Commissioner(Clara Kahindi) and Area chief(John Kamau).

CLARAH KAHINDI
ASS. COUNTY COMMISSIONER
LIMURU.
Clf.
ID. NUMBER : 23586913

JOHN KAMAU MWAURA
SNR CHIEF
RIRONI LOCATION
Mwaura.
ID NO 7485210.

Clf. Mwaura.

ASSISTANT COUNTY COMMISSIONER LIMURU 04 SEP 2014 P.O. Box 120 - 00217 LIMURU

CHIEF
RIRONI LOCATION
P.O. BOX 120-00217
LIMURU

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VISITORS REGISTER - BARAZA HELD ON THURSDAY 14 AUGUST 2014 AT THE FARM IN RIRONI

NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
1	Dennis M. Nyaga	Gatimu	1879684	0720803654		[signature]
2	Peter mbiu	Gatimu	1123830	0723472429		[signature]
3	James Kamweru	Gatimu	8432633	0705589175		[signature]
4	BEATRICE NJINYARI	Gatimu	26626658	0715213505		[signature]
5	Lucy wairimu	Gatimu	22560571	0728926162		[signature]
6	BENSON GACHERU	GATIMU	1361118	071272908		[signature]
7	J.M. Mjehu	GATIMU	0920273	0722259233		[signature]
8	Rosemary warmiku	GATIMU	9325050	0727930547		ROSE
9	David mwaura	Gatimu	3430230	0713786490		[signature]
10	John Njoroge Ngugi	Gatimu	7253971	0717799024		[signature]
11	cleophas Simiyu		9238780	0721752718		[signature]
12	Peter oluu Kotoma		0742.7	-		[signature]
13	DAVID GACHUMI	GATIMU	5206264	0727763049		[signature]
14	E.M. NJUGUNA	RUTHUI	3100148	0727522909.		[signature]
15	CHARLES MBOCHI N	GATIMU	11148305	0732234917		[signature]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
16	LEAH WAHU	GATIMU	29090029	0719834817		
17	Loise Wanjutti	GATIMU	30720298	0714064295		
18	Ndungi Kangethe	Gatimu				
19	Rev. Stephen Karanja	Gatimu	8485739	0733-272311	Stephen wkaranja 57@gmail.	
20	CATHERINE WANJIRU	GATIMU	13214365	0712561950		
21	PETER NGIGI	GATIMU	7249653.			
22	ANDREW N. NJUGUNA	GATIMU	1307215	0733 245217		
23	DAVID NDUNGO	GATIMU	11817902	0725-981285	david ndungu@3000	
24	Teresiah Muthoni	Gatimu	21150513	0729868632		
25	JAMES NGARI	KBC	10058153	0726927304	jnmurangpk@yahoo.com jnmwangokk@yahoo.com	
26	Naomi wambuiKaburu	Gatimu	6606054	—		
27	Amos	Wesonga	22678341	0716613210		
28	ZIPPORAH	GATIMU	26255899	0100046900		
29	Jonum Mwaura Wainaina	Rironi	7657751	0727 154992		
30	Margaret Muthoni	Gatimu				

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
31	Virginia Nyambura	Gatimu	5207563	—	—	
32	FLORENCE KAJUJU	GATIMU	30163829			
33	LUCY NJERI	GATIMU	"	07 "	"	"
34	Zipporah Wairimu	Gatimu	20590000	0704738476		
35	Mangiriti wangari	gatimu	3086391	0715822731		
36	Rose Njeri	gatimu	13214164	0725062078		
37	Rachel wambui	Gatimu				
38	PETER Gathii	Gatimu	8510915	0722211812		
39	John Ndungi mureno	RIRONI	10562670	0722393132		
40	Mbaki kangethe	Gatimu	Nil	0701855727		
41	KAREN KANGETHE	RIRONI	14513942	0724333376		
42	James G Archum	GATIMU	20645?	0724356119		
43	Njuna kungu	Gatimu	Nil	Nil		
44	STEPHEN KANGETHE	GATIMU	28574952	0702482283		
45	J.J. GATERE	GATIMU	20277002	0737246877		

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
46	Joyce Wanjiru	Gatimu	2822808	0725813261		Wanjiru
47	Jane Wanjiru	Gatimu	21046676	0713357652		[illegible]
48	LEAH MAGIROI	GATIMU	27949550	0714962657		[illegible]
49	JOYCE WANJIKU	GATIMU	10228692	0721867080		[illegible]
50	Eunice Njeri	Gatimu	20111263	0723858188		[illegible]
51	Teresia Kabaki	Gatimu				T. Kabaki
52	Lucy Wangeci	Gatimu	12476250	0721976287		Lucy.
53	Hannah Njoki	Gatimu		0712918121		Hn.
54	Mary Ndiko	Gatimu.		0720325678		
55	Esther Wamaitha	Gatimo				[illegible]
56	PAUL KANGETHE-KURIA	SITE (ACRE TANO)	10975677	0720946951		[illegible]
57	Pauline Wairimu	Gatimu Rironi		0714409844		" "
58	Mercy Wambui	Rironi		07 "		" "
59	ERNEST NJOGU	GATIMU	16085067	0721576589		[illegible]
60	Joseph Mwaura	GATIMU		0710240987		[illegible]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
61	HANNAH WAIRIMU	GATIMU	25138217	0719426215	-	
62	ROSE WAHU	GATIMU		0715407730		
63	George Kamau	GATIMU	9325396	0724399242		
64	JAMES MUNIU	GATIMU	4697875	072382 9707		
65	PAUL W. MBOCHI	GATIMU	5215843	0720-980080		
66	Rina Munyua	Redform	7080102	0725627603		
67	Edith Nyokabi	Gatimu	28363286	0725918947		
68	MARTIN MUTWIRI	GATIMU	23167648	0711795628		
69	Henry Kahuki	RIRONI	12921184	0732670707		
70	C. N. WAIGI	BOX 189 Limuru (Gatimu)	0971109	0733 722068		
71	CHARLES GICHOHI KIARIE	1904 - 00200 NAIROBI GATIMU	22287593	0720763754	@gesche@yahoo.com	
72	Lucy Mumbi	Gatimu		0723 7[illegible]35		
73	Rehab Wambui	Gatimu	-	-	-	
74	SHELLA KABERA	GATIMU	13338332	0721724757		
75	Hannah Wiehi	Gatimu				

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
76	SIMON MJUORIE	GATIMU	4511166	0719153253		
77	Nyaga Mbochi	Gatimu	3082811			
78	Beatrice Waithira	Gatimu	21751410	0727470204		
79	Eunice Nyambura	Gatimu	27275736	0713665425		
80	Jane Wangui	Gatimu.	27767628 · 0727485	0727485820		
81	Peninah Wambui	Gatimu	5207585			
82	Mwangi Andrew	Gatimu	24724280	0725735574		
83	Joseph M. Njuga	Rironi water project	10086744	0721-316687		
84	Evanson K. Kinyanjui	GATIMU	0920999	0720782386		
85	Peter Mwaniki Kinyanjui	Gatimu	26965332	0724824521		
86	John Kinyanjui Muthuya	Gatimu	25471544	0725911146	JoMuthush@gmail.com	
87	Margaret Wamaitha	Gatimu				
88	Jack M Kamau	Gatimu				
89	D. Kegia	Gatimu				
90	William K Mieri	Rironi				

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
91	Jane wambui Ndungu	Gatimu	32 90 642	0724556110		
92	Monicah M Kimani	Gatimu	11 05 4250			
93	Ruth Wairimi	Gatimu	16054742	0724662116		
94	CHARLES KIRONJ	GATIMU	8432688	0727652266		
95	SIMON KAMAU	GATIMU	3087109	0721845301		
96	Paul Nyoro	Gatimu	13029364	0721 552313		
97	Mary Nyambura	Gatimu	13031617	0723897569		
98	S. Nduku	Gatimu	3403688	0720536359		
99	cecilia wanjiku	Gatimu	6246231	0710333301		
100	Eunice wanjiru	Gatimu	—	—		Wanjiru
101	Jane wairimu	Gatimu	—	—		
102	Susan Wanjiru	Gatimu	96020	0707844812		
103	Mary Waithera	Gatimu	4886209	0715267164		Mary
104	Robert Kangille	Gatimu				
105	Rev E.N. Matere	"	5571404	0721272170		

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
106	Simon Samuel Mbatia	Rironi	0333640	0722811016	mikamau@yahoo dot com	[signature]
107	John N. Karanja	Gatimu		0721597823		[signature]
108	Lucy Nyambura	Riron	3507381	0722222146		[signature]
109	Arthur Mbugua M.	Gatimu	21925147	0720-789600	—	[signature]
110	Njehu Kabera	Gatimu				[signature]
111	Ndungu Nzeke	Gatimu				[signature]
112	John Munda	Rironi	21970831	0721992979	johnmundi@yahoo	[signature]
113	Joseph Ndichu	Gatimu	46524855	0721690068		[signature]
114	Mary Njeri	Gatimu		0704-592304		[signature]
115	lydiah wanjiku	Gatimu	20278607	0720-216296		[signature]
116	VIRGINIA WAITHIRA	Gatimu		0719-771136		[signature]
117	ALICE W. KABAIKU	GATIMU	24206043	0720-393377		[signature]
118	Teresiah Wairimu Kamau	Gatimu	31988530	0716-545467		[signature]
119	JAMES NGANGA	NGECHA	1017732	0726234604		[signature]
120	P.M. IGAMBA	GATIMU	[illegible]	[illegible]		[signature]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
121	Onesmus K Kabue	Gatimu	0710720	0720879223		[signature]
122	LYDIA WANJIKU	GATIMU		0721885276		[signature]
123	ELIZABETH WANJIKU	GATIMU				[signature]
124	SERAH MUTHONI	GATIMU		0751368393		
125	CHRISTOPHER M. KARATU	KAMANDURA	7279277	0722796849		[signature]
126	Serah Nyambura	Gatimu	10344794	0722334808		[signature]
127	ALICE WANJIRU	GATIMU		0723551387		[signature]
128	HANNAH RUGURU	GATIMU		0721327305		HRuguru
129	ERders. Jotte Mgupo	Gatimu		0705 274168		[signature]
130	EVANSON M. NJOROGE	GATIMU		0723009040		[signature]
131	Daniel M Muri	GATIMU	11445405	0722638472		[signature]
132	Monican wanjiru	Gatimu		20067097		[signature]
133	KINYANJUI	GATIMU	8575057	0722582913		[signature]
134	MOJO S NGIGI	GATIMU	861440	0725371213		
135	VERONICA Nyambura	Gatimu				

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
136	Joseph Njuguna	Gatimu	Njuguna	4341		Njuguna
137	Sherah Wanjiru	Gatimu	Nil	Nil		[illegible]
138	Jane wanjiru	Gatimu	"	"		[illegible]
139	JANE maina	Gatimu	8614366	0702591314		Jane
140	Mary Maina	Gatimu		0713937246		Mary
141	Regina Nyambura	Gatimu	"	"		Regine
142	Mary Wambui	Gatimu	"	"		MW
143	Ebrahim Njoroge	Gatimu	"			[illegible]
144	Beatrice mwaura	Gatimu	5214066	0720727907		[illegible]
145	GRACE MWANIKI	Gatimu	3086441	0713234392		[illegible]
146	John Wanyoike	gatimu	25833729	0720221333		[illegible]
147	John [illegible]	Rironi	-	0721288733		[illegible]
148	John Karanja					[illegible]
149	Sarah Mbochi	Gatimu				
150	Sophia Nduta	Gatimu				Nduta

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
151	Mtengel.	GATIMU	10573471	0721416320	141 Limuru	
152	WAITHIRA	GATUNDA	23614166	0722174091	[illegible]	[illegible]
153	MAINA.	GATIMU.	4877538	0723302553	—	
154	Fridah Wanjiku	Gatimu	32439829	0724978237		
155	Paul Kamau.	GATIMU.		0720656717		
156	Esther Njeri	GATIMU	12859955	NIL		ESTher
157	peter Githinji	Wainaina				
158	IBRAHIM Njuguna	GATIMU	12526262	0724548523		
159	DUNCAN Ndegwa	GATIMA	22703142	0722411301		
160	JAMES N. GITHUKU	GATIMU	9722444	0727303987	tecvikgen@gmail.com contractors,	
161	SALOM. M. Kamau	Gatimu	NIL	NIL		
162	HELLEN Wanjiru	Gatimu	NIL	NIL		
163	Michael Njuguna.	GATIMU	5209315	0715647263		
164	Robert	Gatimu	4876560	0722750147		
165	LAZARUS NYAGA	GATIMU	14595620	0725720660		

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166	Hanna Nduta.	Gatimu				
167	Rahab Muthoni	Gatimu				[signature]
168	Paul Wamwara	Gatimu		0751730976		[signature]
169	Hanna Wamuhu Kingori	Gatimu				HW
170	Mwanjakama	Gatimu	6242523	0722821176		[signature]
171	Teresia Kwamboka	Gatimu				[signature]
172	M.M. NJORO	RIRONI	0438387	0722893220	munyoro1760@gmail.com	[signature]
173	Hanah wangui	Gatimu	21025539	0710813317		[signature]
174	PETER NJOROGE MUTHI	GATIMU	21647891	0722 635977		[signature]
175	CELINA NJOKI	GATIMU	23138932	0705482634		CN
176	REV Ephraim Waigi	GATIMU	0328717	0722153093		[signature]
177	George Njau	Rironi		0720065747		[signature]
178	Grace Mukami	Gatimu				mukami
179	Salome wambui	Gatimu		0710204983		[signature]
180	John muhuni	GATIMU	3082959	0720081286		[signature]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
181	Mumbi njoka	Gatimu				mumbi
182	Hannah waitherero	Gatimu				[signature]
183	Jane nyakabi	Gatimu				[signature]
184	PETER K. KABUE					[signature]
185	GUCHU CHEGE	RIRONI				[signature]
186	G Njunge					[signature]
187	A WAWERU					[signature]
188	H Waithi	Gatina		0725718146		H.Wa
189	SAMUEL KIMANI	GATIMU	10905303	0723996323		[signature]
190	Florence Njoki	Gatina		0724035551		[signature]
191	Njenge	Njuguna				
192	Kibuba	Kimani				
193	Karanja.	RIRONI	6420586	0721919758	davidkaranja@ya[illegible]	[signature]
194	MWANGI	RIRONI	11349193	0726703704	amwangi.m70@yahoo[illegible]	[signature]
195	NJOROGE	GATIMU	22018422	0717762766	[illegible]	[signature]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
196	GEORGE GITUA W	RIRONI	10767182	0722645703		[signature]
197	James Mbiyu	Rironi		0722443196		James
198	DANIEL MUGURIA	Gatimu	18068434	0700396046		[signature]
199	David Muniu	Gatimu		0722335029		[signature]
200	JOHN MBURU	NGECHA	14595366	0726-606174		[signature]
201	PETER GITAU NJOGU	GATIMU	20771645	0721296370		[signature]
202	Helen Wanjiru			0718356869		
203	Beatrice Wanjiru	Gatimu	28320555	0719706152		[signature]
204	EMILY WANJIRU	GATIMU	26791162	0710535772		[signature]
205	PERIS WANJIKU	GATIMU	0	0710799777		PERIS
206	Josephine Mumbi	Gatimu	0106569			Josephine
207	ZAKAYO MWANGI	Gatimu	6847074			[signature]
208	RACHEAL	Gatimu	2620983			[signature]
209	EUNICE	GATIMU	20258553	0722878913		[signature]
210	NICETA MUTITU	GATIMU	25693711	0714554996		NICETA

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211	LUCY NJERI	NGECHA	28261254	0717007517		
212	SERAH	GATIMU				
213	Joseph L. Mbaki	Gatimu	07[illegible]827	0720711547		
214	LUCY MWARANIA	G. TIMU	13478921	0701972756		
215	GEORGE KUBAI	RIRONI	—	—		
216	James Maina	Gatimu	29329801	0717057847		
217	STEPHEN WAMAI	GATIMU	5363534	0726657251		
218	BENSON KAGWIMA	RIRON	6243478	0720-700515		
219	C W mugo	Gatimu		0711-990488		
220	CHARLES Muiga	Gatina	9324867	0727438450		
221	Lilian Wanjiku	Gatimu	5206296	0729573755		
222	Kassim Njoki	Gatumu	5206025	0729517301		
223	Joseph Wamue	Gatimu	9036315	0712299097		
224	Benson Mbuthia	Gatimu	10080823	0726456		
225	Anne Nuga	Gatimu	9742896	0724[illegible]28		

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226	PAUL MGIGI	GATIMU	11817787	0725537861		
227	JOHN NDUNG'U	GATIMU	31388658	0710540773		
228	Grace Gathoni	GATIMU		0720241968		
229	LOICE WAKANYI	GATIMU		0701503722		
230	Esthear	Gatimu				
231	Jane Mumbi	Gatimu	5252337			Jane
232	Ruth Wanjiru	Gatuma	708754	W.Z		Ruth
233	NAOMI NJERI	Gatimu		0711 948575		Njeri
234	JANE WAIRIMU	Gatimu		0711 948575		
235	NOAH MAKHOTSA	GATIMU		0719011108		
236	MIKA WANJIKU	Gatimu				
237	MARGARET NGAENO	GATIMU				
238	Mary		21465428	0727338678		
239	Mary Njeri	gatimu		0700401120		
240	SNR. Pst. Francis Njenga	Gatimu	24531652	0724705919		

REDCORAL PROPERTIES LTD

VISITORS REGISTER - BARAZA HELD ON THURSDAY 14 AUGUST 2014 AT THE FARM IN RIRONI

NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
256	Peninnah Wambui	Gatimu	30164162	0711214912		
257	Jane Njambi	Gatimu				[signature]
258	Joyce Wangui	Gatimu	21332397			[signature]
259	Hannah Wambui	Gatimu				Wambui
260	Hannah Ndula	Gatimu		—		Ndula
261	Faith Wanjiku	Gatimu			—	[signature]
262	Ann Wariara	Gatimu	27700389			[signature]
263	Nancy Waruri	Gatimu	5206059			Nancy
264	Josephine Karimi	Gatimu		0728712628		JK
265	Caroline Murugi	Gatimu	26508993	0713 052703		[signature]
266	Boris Kimani	Gatimu	21559066	0713441763		[signature]
267	Robert Gitau	Gatimu	21842985	0706121372		[signature]
268	Sathy K. Maungu	Gatimu	10485453	0720-846414		[signature]
269	Joyce N. Gitu	Gatimu	5206367	0720915172		Joyce
270	Jane Njeri	Gatimu	10024575	0704583489		[signature]

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
241	Jane Wambui	Gatimu	11391935 H3+9	0724458015	250	
242	Keziah Nyawira Nyaguthii	Gatimu	0552022	0720174916	250	
243	LUCY GATHONI	GATIMU	11645576	0710641415		Lucy
244	MARGARET NJOKI	Gatimu	5207660	0700532444		MN
245	JOSEPH KINYANJUI	GATIMU	3087086	0729385746		
246	Wanda Solomon K.	Gatimu	22462453	0723436628	11BC-00217 LRM	
247	Joseph NDAI	GATIMU	2402413	0705 161619		
248	JANE NJERI	GATIM	28571914	0714237872		
249	JAMES NGUGI M	GATIMU	23444298	0722918811	119	
250	Elvid Nduga	GATIMU		0724574963		
251	Naom W. Ndungu	Muguga	10974579	0710982465		NW
252	Peter Kariuki Kamau	Gatimu	0715323	0720483956		
253	Virginia Muguro	Gatimu	11817833	0722235307		Virginia
254	Michael Kinyanjui	GATIMU	23200784	0723-800643		
255	ANNES GACHUMI	GATIMU				

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NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
271	Michael Ndungu	Ngecha	1187906	0700703683		
272	Lucy Wambui	Gatimu				
273	Esther Kinyanjui	Gatimu		0729-866725		
274	[illegible]	[illegible]		[illegible]		
275	Helen Wangai	[illegible]		[illegible]		
276	Jane Mumbi	[illegible]		[illegible]		
277	Samuel Kinyanjui	Gatimu		0725384625		
278	PAUL MWEGA	MWANGI		0706560045		
279	Milka Nduta	Gatimu				
280	ELIUD GITAU	GATIMU	3078968	0727230036		
281	E Kamau		725 00[illegible]			
282	Monica Muthoni	Gatimu		0720836111		
283	J. KARANJA MUCHAI	RIRONI	23608542	0720712089	jasmuck@gmail.com	
284	Zipporah Kabura	GATIMU		0715897743		
285	Zipporah Kabura	GATIMU	24561313	0713 623 162		

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VISITORS REGISTER - BARAZA HELD ON THURSDAY 14 AUGUST 2014 AT THE FARM IN RIRONI

NO	NAME	RESIDENTIAL ADDRESS (LR NO.) / COMPANY / INSTITUTION	ID NO	CELL NO.	EMAIL ADDRESS	SIGNATURE
286	Sharon / John	NAIROBI	—	0704280082	Sharon@interafrica.com	Sharon
287	DAVID M MWAURA	GATIMU	8241871	0722 235155		
288	Christopher Nyoike	Limuru - Regal Spear Invt. Co. Ltd.	24501961	0723388095	iregalreality@gmail.com	
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MINUTES OF THE MEETING WITH THE COUNTY DIRECTOR OF ENVIRONMENT, KIAMBU ON THE PROPOSED RED CORAL DEVELOPMENT IN LIMURU

Minutes of Meeting

SUBJECT: Red Coral Development SEA Meeting with the County Director of Environment, Kiambu.

HELD AT: Kiambu County NEMA office, 5th Floor, MAPA Building, Kiambu Town

DATE & TIME: 22nd May 2014 at 11:00am to 12:00 Noon

REFERENCE: HHEA 10442K/4/01

IN ATTENDANCE:

	Attendees	Initials	Position	Company
1.	Josey Njoki Mukiri	JN	County Director of Environment	NEMA, Kiambu
2.	Kennedy Kijana	KK	Project EIA Expert	HHEA Ltd
3.	Chris Childs	CC	Ass. Project Manager	Planning Systems Services

ABSENT WITH APOLOGY:

AGENDA

1. Introduction of the proponent and the proposed Red Coral Development
2. Discussions on the key issues to be considered in the SEA study of the proposed development
3. A.O.B.

Item	Description	Action	Timeline
1.0	**Introduction**		
	JN welcomed the team to the meeting and KK introduced the project team and the agenda of the meeting. KK also thanked JN for agreeing to meet the project team after a short notice.		
2.0	**Project SEA Issues**		
2.1	**Biodiversity protection:**		
	JN noted that NEMA takes great concern as far as biodiversity of the project area and noted that the previous land use was agricultural, biodiversity will be affected especially the trees. KK however noted that most of the project site is predominantly grassland with few shrubs and scattered trees with exception of the north eastern side of the land which is forested. JN urged the project implementers to do a lot of greening of the area especially on the proposed low density residential areas and the natural open spaces that are featured in the project design.		
2.2	**Source of Water:**		
	JN noted that water around Limuru area has been an issue and underground water utilization through drilling of boreholes is rampant in the area. She noted that on many occasions borehole water levels are getting deeper and deeper. CC pointed out that the project intends to drill boreholes as the main water supply for the development since the supply from Limuru water shall not meet the projected project demand. JN suggested that other water sources should be explored and		

Item	Description	Action	Timeline
	incorporated in the designs like rain water harvesting, recycling of grey water for irrigation and other non-domestic usage.		
2.3	**Transport Management:**		
	JN noted that NEMA is concerned with air pollution and congestions as a result of populated developments such as the one being proposed. She observed that unless proper transport management system is put in place, the roads leading to the development may experience perennial traffic jams just like in other known estates in the neighbouring Nairobi County. CC noted that a transport management consultant had been incorporated in the team and will advise on the matter.		
2.4	**Solid Waste Management**		
	JN noted that currently Limuru area has no waste disposal site that has been licensed by NEMA but pointed out that the County has received funds for a proposal to construct a Sanitary Landfill at Ting'ang'a in Kiambu subject to the acquisition of land. This however is at development stage and the proponent should explore ways and systems to manage solid wastes from the development. She advised that the proponent should ensure that solid waste management function should be retained under the estate managers who may introduce cleaner production methods like waste minimization and waste sorting at household level.		
2.5	**Waste Water Management**		
	CC observed that the proponent shall install mechanical waste water treatment plants in the development and endeavor to recycle the grey water as much as possible. JN observed that even though there is waste water management in place, proper maintenance of the system should be put in place to ensure the system is functioning properly. The proponent should also explore on treated effluent discharge point at the nearest surface water if possible.		
2.6	**Offsite Impacts**		
	JN advised the project team always to procure their services and materials from NEMA registered and licensed suppliers who have put in place mitigation measures for offsite impacts.		
2.7	**Public/Stakeholder Consultation**		
	KK reported that so far most of the project adjacent neighbours have been interviewed one on one about their knowledge and perceptions about the proposed project. He noted that later Barazas and Stakeholder forums shall be held to elicit public opinions on the project that will shape the final designs. CC added that previously major stakeholders had been interviewed concerning the project including KeNHA, KeRRA, KPLC, LIWASCO, WRMA and Rift Valley Railways Ltd. JN observed that proper consultations should be done with the local community and groups such as the residents associations and civil societies including the central government. She offered to attend consultative meetings on the project or send representatives from her office. She also offered to send contact of a very vibrant neighbourhood association from the nearby area to KK for further consultation on the project.	JN to send a contact of a neighbor hood associati on to be consulted	ASAP
	KK noted that some of the consulted neighbours were concerned that the water supply from the community water project located at the proponent premises would be disrupted when the project commences. CC to liaise with the Proponent to know the way forward on the	CC to report back	

Item	Description	Action	Timeline
	community water project.		
3.0	**A.O.B**		
	Since there was no other business, the project team thanked JN for her time and the meeting was adjourned at around 12.00 Noon.		
	End of Minutes		

Minutes Prepared by: ***Kennedy Kijana***

Circulation:

- HHEA Red Coral Project Staff
- All present

Ref: 13.02

RED CORAL				
18/06/13, KeNHA offices, Blue Shield Towers				
Attendees:	**Initials:**	**Company:**	**Initials:**	**Position:**
Jazir Premji	JP	Planning Project Management Ltd	JP	Project Manager
Kavit Shah	KS	Redcoral Properties Ltd	KS	Client
Ranee Nanji	RN	Redcoral Properties Ltd	RN	Client
Engineer Charles Obuon	CO	Kenya National Highways Authority	CO	Manager (Design)
Brian Akhonya	BA	Kenya National Highways Authority	BA	Assistant

Apologies:				
Cameron Rush	CR	Planning Project Management Ltd	CR	Director
Next Meeting:				

AGENDA

1 Introduction
2 Meeting Agenda *(As per email forwarded on 10/06/13)* and questions
3 Way forward/AOB

Item	*Description*	*Action*	*Timeline*
1.0	**Introduction**		
	• JP opened the meeting by thanking Engineer Charles Obuon and his team for giving us the opportunity to meet with them in relation to the Redcoral development.	JP	
	• JP also thanked Engineer Charles Obuon and Brian Akhonya for providing us with the preliminary designs for the A104 as requested after our last meeting held on 23/04/13.	JP	
2.0	**Agenda & Questions**		
	• JP then took the team through the previous set of minutes and summarized the following: **Upgrading of Western access** ➢ As agreed, our interim solution would be to have acceleration and deceleration lanes ➢ As agreed, the preferred junction type would be a Priority type A junction (Left in left out junction) **Upgrading of Northern access** ➢ As agreed, the preferred junction type would be a Priority type A junction ➢ As agreed, the minimum intersection spacing would need to be 150m from the existing junction (along the D407 road)	JP	
	• JP queried whether the acceleration/deceleration lanes would be included in the road reserve or whether third party land would need to be acquired.	JP	
	• CO responded that maps would need to be bought from the Director of surveys to ascertain the road reserve widths for both the A104 and C62 and hence establish whether third party land would need to be acquired in relation to our interim solution for the Western access.	KS/RN	27/06/13
	• CO also reported that these maps should include co-ordinates.	CO	
	• JP then informed <u>ALL</u> that based on the preliminary layout designs received from KeNHA i.e. the section of route between Ngecha and	JP	

	Rironi interchanges, the drawings propose a service road running parallel to the main highway from the western access which runs South to Ngecha interchange, however the site access only links to the South as there is no service road shown between the western access and a point approximately 400 meters to the North.		
	• CO advised he would speak to a colleague on this matter and report as to why this is the case.	CO	21/06/13
	• JP also queried as to what the minimum lengths/standards for acceleration/deceleration lanes would be considering the road has a dual carriageway speed limit of 110km/hr *(As previously confirmed during our meeting held on 23/04/13).*	JP	
	• BA responded that the minimum length for an acceleration lane would be approximately 120m while the minimum length for a deceleration lane would be slightly less. BA to confirm	BA	21/06/13
	• JP queried as to what the minimum width for an acceleration/deceleration lane should be.	JP	
	• BA responded that the minimum width would be 3.5m.	BA	
	• RN queried on the way forward in relation to upgrading our access towards the West.	RN	
	• BA responded that the team would need to write a formal letter requesting for an approval for temporary access of the main highway.	BA	
	• KS clarified that the formal letter was in relation to our proposed interim solution.	KS	
	• BA confirmed that this was correct and also reported that the formal letter would need to be addressed to the Director General and this should be accompanied by designs for our interim solution.	JP/CR	TBC
	• BA also suggested that the interim/temporary road access should not be a tarmac road i.e. should not be developed to full standards and that this should remain as a gravel/muram road as this is only <u>temporary</u> and once KeNHA's designs are implemented, this would mean demolishing of our interim road.	BA	
	• CO also reported he would speak to Engineer Denis Odeck after which an introductory letter can be requested from Engineer Denis Odeck to allow the Client's consultant to liaise directly with *Eser project and Engineering co Inc* and *Botek Bosphorus technical consulting co* in order to try and merge our designs considering the scale of our development.	CO/JP/ CR	24/06/13
	• RN queried on the plans for the Ngecha-Chunga-Mali road i.e. D378 which passes to the South of our plot.	RN	
	• BA responded that KeNHA would only be responsible for the following classes of roads: ➢ **Class A-** These comprise of international trunk roads linking centers of international importance and crossing international boundaries or terminating at international ports. ➢ **Class B-** These are national trunk roads, originally defined as linking nationally important centers, but more recently re-interpreted as linking provincial headquarters and other important centers to the capital, to each other or to the international road network. ➢ **Class C-** These are primary roads and were originally defined as linking provincially important centers to each other or higher class roads; this has been reinterpreted more recently to mean linking district headquarters to each other and higher level roads or centers.	BA	
	• BA also reported that the Ngecha-Chunga-Mali road (D378) would fall under the jurisdiction of KeRRA.	BA	
	• JP to write to KeRRA to establish any future planned improvements for Ngecha-Chunga-Mali road (D378).	JP	25/06/13
	• RN queried as to whether CO/BA may have a contact in KeRRA who we	RN	

	could speak to regarding the above. • JP queried on whether purchasing of land near to the Highway could facilitate a bigger junction for the benefit of Redcoral development. • BA responded that this would depend on the maps purchased, extent of road reserve and our designs. • BA also informed ALL that KeNHA would only be responsible for any works up to the edge of the road reserves. • JP queried as to who would bear the cost of the interim solution • BA responded that there would be two options, however both of these would be on the Client: ➢ If third party land does not need to be acquired, then the cost of the road would be on the Client i.e. muram/gravel acceleration/deceleration lanes ➢ If third party needs to be acquired, the client would bear both the cost of the land and the road (Provided that there has been no encroachment onto the road reserve). • JP requested if we could receive any raw traffic data for the A104. BA to follow up • BA responded that KeNHA are only in possession of processed data, however once we receive the introductory letter from Engineer Denis Odeck to liaise with the design consultants who have been contracted by KeNHA, this can then be requested. • RN informed CO and BA that towards the Northern access, there are on-going discussions/negotiations with the adjacent developers in providing access off Limuru road. • JP informed CO/BA that after meeting with the Limuru Physical Planning liaison committee we were informed that a minimum width of 20m would need to be provided of Limuru road. • CO raised concern over the gradients and steep slopes between Limuru road (C62) and our Northern most property boundary. • JP advised that from our preliminary vertical alignments received from our Transport Planner, we would be looking at a maximum gradient of 11%. • CO advised that this would need to be carefully considered however he mentioned that a gradient of 8-10% could potentially work, however this would attract a heavy cost. • JP advised that at the next stage of works, a cost benefit analysis would be done based on different options for access to the North to establish the most cost effective solution based on construction cost and acquiring of land. • JP queried as to whether the existing fill slope to the South of Limuru road is within their road reserve, as we may face similar challenges with our access in relation to the North. • BA confirmed that this does not fall within the current road reserve. • BA informed ALL that in relation to our access to the North, a priority type B junction could also be considered. • JP queried on whether Ngecha interchange layout could be improved to a simpler layout which could be less confusing to motorists. • BA responded that all the interchanges will incorporate signs/directions which will facilitate motorists.	JP BA BA JP BA BA BA RN JP CO JP CO JP JP BA BA JP BA	24/06/13
3.0	**Actions/Way forward**		
	• Relevant maps in relation to the A104 and C62 need to be purchased *(These should include coordinates).* • CO to advise why the preliminary designs from KeNHA do not incorporate a service road between the western access and a point approximately 400 meters to the North between Ngecha and Rironi	RN/KS CO	27/06/13 21/06/13

	interchanges along the southbound carriageway. • BA to confirm the exact lengths of road that would be needed to facilitate acceleration/deceleration lanes i.e. to facilitate our interim solution • JP/CR to write formally to the Director general to request for temporary access i.e. our interim solution in relation to access from the West *(These should also be accompanied by designs).* • CO to speak with Engineer Denis Odeck and inform him of the Redcoral development, after which an introductory letter can be requested to allow the team to: ➢ Retrieve raw traffic data along the A104 from the Consultants contracted by KeNHA. ➢ Allow our Consultant to be in touch with the Consultants contracted by KeNHA in relation to merging of designs. • JP to write to KeRRA to establish any future planned improvements for Ngecha-Chunga-Mali road (D378). • BA to forward traffic data for the C62 (Limuru road).	BA JP/CR CO/BA /JP JP BA	21/06/13 TBC 24/06/13 25/06/13 27/06/13
	End of Minutes		

Ref: 13:02

RED CORAL				
23/04/13, KeNHA Offices – Blue Shield Towers, Upper Hill				
Attendees:	**Initials:**	**Company:**	**Initials:**	**Position:**
Jazir Premji	JP	Planning Project Management Ltd	JP	Project Manager
John Daley	JD	Ove ARUP & Partners International Ltd	JD	Associate
Ranee Nanji	RN	Red Coral properties Ltd	RN	Client
Kavit Shah	KS	Red Coral Properties Ltd	KS	Client
Richard Kinoti	RK	Howard Humphreys East Africa Ltd	RK	
Engineer Charles Obuon	CO	Kenya National Highways Authority	CO	Roads Manager (Design)
Engineer Oguto Otieno	OO	Kenya National Highways Authority	OO	Assistant
Brian A Shikoli	BA	Kenya National Highways Authority	BA	Assistant

Apologies:				
Cameron Rush	CR	Planning Project Management Ltd	CR	Director

Distribution to those above and:				
Next Meeting:				

AGENDA

- Introduction
- Seek acceptance with regard to the proposed scope of the study
- Establish any available traffic data
- Establish the level of information and documentation that would be required to be submitted in support of bringing forward the Master plan.
- Advise on any proposals and programme for any major highway improvements in the area, such as the aforecited roads, which could affect current traffic patterns in the vicinity of the development. (Identification of sub-regional transport opportunities and confirmation of all transportation infrastructure planned improvements and or planned off-site improvements)
- Way Forward
- AOB

Item	Description	Action/Statement	Action Owner	Timeline
1.0	**Introduction**			
1.1	JP opened the meeting by thanking Engineer Obuon and his team of KeNHA for giving us this opportunity.JP also introduced the Client and the Consulting team including: ➢ Transport Planner ➢ Civil Engineer	Statement		
1.2	JP gave a brief introduction to the Clients parcel of land which included the following: ➢ Size – 387 acres ➢ Plot boundaries ➢ Current land use - Agricultural ➢ Client intends put up a mixed use development	Statement		
2.0	**Seek acceptance with regard to the proposed scope of the study**			
2.1	JP reported that currently our site is landlocked and that the Client is seeking to upgrade their access in relation to: Limuru Road (C62) – Towards the North of the site Nairobi- Nakuru Road (A104) – Towards the West of the site	Statement		
2.2	JP also reported that currently Consultants have been appointed to conduct pre-feasibility studies. JD added that these included; Market Analyst, Civil/Electrical Engineer, Environmentalist and Transport Planner. JD also highlighted that the purpose of the exercise being conducted by ARUP was to identify constraints and opportunities in relation to access.	Statement		
3.0	**Establish all traffic data**			
3.1	JD enquired on available traffic data. CO responded that there currently is existing traffic data for Rironi. In addition, CO noted that KeNHA would provide traffic data/preliminary designs on the upgrading of the A104 from JKIA- Likoni - James Gichuru - Rironi	Action	CO/OO	26/04/13
3.2	JD also enquired on traffic data available on C62 (Limuru road). CO reported that this would be based on historical data however OO noted that he would need to check on this. CO also noted that KeNHA would provide historical traffic data for the C62 (Limuru Road).	Action	CO/OO	26/04/13
4.0	**Major highway planned improvements/transport infrastructure improvements/Design standards**			
4.1	JD enquired on planned future improvements for the A104. CO responded that currently the A104 would retain two lanes on either side, however he noted that along this major highway there would be more interchanges, particularly at junctions. OO also noted that this project is currently at tender stage i.e. upgrading the highway from JKIA- Likoni - James Gichuru - Rironi.	Statement		
4.2	BA reported that traffic from different phases/sections of the development would need to be generated prior to looking at upgrading of roads, as this would highlight all generated traffic. JD provided a rough estimate of approximately 1500 households.	Statement		

4.3	In relation to access from the Western side being critical, JD added that KeNHA would also need to look at how adjacent properties along the highway would be provided access in addition to LR 11532. CO responded that currently there are existing service roads along the highway. JD noted that the service roads are only on the Northern bound carriageway between the Interchanges which are to the North and South of the plot.	Statement		
4.4	CO reported that all traffic volumes which are generated from the anticipated development would influence junction types/standards. CO also reported that service roads would need to be implemented along both the North and South bound carriageways of the A104 (Nairobi-Nakuru Road) between the Northern and Southern plot boundaries. BA also reported in addition to service roads being provided, there would also be a major junction to serve the highway.	Statement		
4.5	JD reported that access from the Western boundary would be critical as this would allow commuters from the development to have an alternative to access the highway; and that service roads would help facilitate this.	Statement		
4.6	JD also enquired on whether the A104 (Nairobi-Nakuru Road) and C62 (Limuru Road) would be classified as Urban or Rural Roads. OO responded that the C62 would be classified as an Urban Road. CO also added that the A104 would be classified as a mix of both Urban and Rural.	Statement		
4.7	JD enquired on the design speeds of both the A104 and C62. CO responded that speed limits would be as follows: A104 – 110km/hour (Dual Carriageway speed limit) C62 – 80km/hour	Statement		
4.8	JD enquired on road reserve widths for the two roads i.e. A104 (Nairobi-Nakuru Highway) and C62 (Limuru Road). CO noted that the current road reserve width for the A104 is 60 meters; however this may not be sufficient with the incorporation/implementation of service roads. CO also added that the road reserve width would need to be confirmed as this could be 80 meters. OO noted that the road reserve width for the C62 is 40 meters.	Action	CO/OO	26/04/13
4.9	JD reported that the team would be content if the left in left out access along the western boundary could be upgraded to a left in left out junction. BA responded in relation to access to the A104, the most likely option would be to have a left in left out junction with an acceleration and deceleration lane in the interim until service roads are implemented by KeNHA. CO confirmed that service roads implemented by KeNHA would be within the road reserve. In addition, BA also reported in relation to the North access, the most likely option would be to have a priority type A junction.	Statement		
4.10	JD enquired on junction spacing's in relation to access from the North via Limuru Road as there is an existing junction off Limuru Road. OO responded that the existing junction to the north of the site is a staggered junction and also clarified the following minimum junction spacing's : ➢ Staggered junction – 80 meters (Minimum distance between junctions) ➢ Type A junction – 150 meters (Minimum	Statement		

	distance between junctions)			
4.11	JP enquired on the actual road reserve width for Limuru Road and if the actual road reserve for a Class C road is standard. OO responded that not all Class C roads may have the same road reserve widths, and that in the case of Limuru Road, the desirable road reserve width is 40 meters.	Statement		
5.0	**Way forward**			
5.1	CO noted the way forward would be as follows: ➢ KeNHA to provide traffic data/preliminary designs on the upgrading of the A104 from Likoni - James Gichuru - Rironi ➢ KeNHA to provide historical traffic data for the C62 (Limuru Road).	Statement		
6.0	**AOB**			
6.1	KS raised a query in relation to the adjacent properties along the A104 which may fall within the road reserve. OO/B responded that any adjacent properties which fall in the road reserve would be compensated.	Statement		
7.0	**Actions**			
	Action Items:			
3.1	CO of KeNHA to provide traffic data/preliminary designs on the upgrading of the A104 from JKIA-Likoni - James Gichuru - Rironi	Action	CO/OO	26/04/13
3.2	CO of KeNHA to provide historical traffic data for the C62 (Limuru Road).	Action	CO/OO	26/04/13
4.8	CO/OO of KeNHA to confirm road reserve width for A104.	Action	CO/OO	26/04/13
	End of Minutes			

Ref: 13.02

RED CORAL				
30/04/13, WRMA offices, Industrial Area				
Attendees:	**Initials:**	**Company:**	**Initials:**	**Position:**
Cameron Rush	CR	Planning Project Management Ltd	CR	Director
Jazir Premji	JP	Planning Project Management Ltd	JP	Project Manager
Bernard Ochieng	BO	Howard Humphreys East Africa Ltd	BO	Project Manager/Water and Sanitation Engineer
Anthony Bichii	AB	Howard Humphreys East Africa Ltd	AB	Principal Water & Sanitation Engineer
Dan Odero	DO	Howard Humphreys East Africa Ltd	DO	Senior Hydrologist
Peter K Supeyo	PKS	Water Resources Management Authority	PKS	Sub-regional Manager for Nairobi Sub-region

AGENDA

- Introduction
- Howard Humphreys – Questions
- AOB

Item	Description	Action	Timeline
1.0	**Introduction**		
	• PKS opened the meeting by welcoming all and requested that all persons in the meeting introduce themselves. In addition PKS introduced himself as the Sub-regional Manager for the Nairobi Sub-region office.	PKS	
	• CR opened the meeting by providing an Introduction to the Sub-regional Manager of WRMA (Peter K Supeyo) which included the following: ➢ Project Brief ➢ Project team ➢ Brief purpose of the meeting	CR	
	• The rest of the project team then provided introductions	All	
	• PKS informed all that the property would fall under the jurisdiction of the Nairobi sub-region as this extends up to Limuru.	PKS	
2.0	**Howard Humphreys – Questions raised**		
	• DO reported that groundwater is be the best available water resource for our site. In addition DO reported that preliminary calculations anticipate the site to utilize roughly 1000m3/day.	DO	
	• DO provided all with a copy from the Hydrology report submitted to PKS for review.	DO	
	• DO reported that currently, there would be three potential areas for groundwater abstraction (To the North of our plot, to the East and South West of the plot – See attached document).	DO	
	• DO reported that the flow of water runs along the fault lines from the North of the plot towards Kikuyu springs.	DO	
	• DO also reported after preliminary calculations, it is estimated that up to 850m3/day would be transmitted across the property.	DO	
	• DO also reported that flows of water towards the North cannot be	DO	

	estimated due to the hydraulic gradients. • DO also informed all that due to fault lines along the property (See document attached) this could affect the abstractable yield. In addition this could also affect the depths of boreholes on the site. • DO also informed <u>all</u> that WRMA's regulation for water abstraction states that only 60% of the total desired yield may be abstracted for the property use (Pumping on an maximum of 10 hours). • *DO noted that 60% of 850m3/day would equate to 500m3/day and raised the question of the possibility of abstracting such a yield.* • PKS responded that Limuru is not fully exploited in terms of water abstraction and also noted that it would be possible to be allowed to abstract such a yield. • DO reported that currently, minimum spacing requirements between boreholes is approximately 106m and that this is based on the area of well influence for the aquifer here. • DO also reported that this would roughly equate to: ➢ 6 boreholes along the Eastern boundary ➢ 2 boreholes to the North of the plot ➢ 1-2 boreholes towards the South West of the site • PKS reported that all information would need to be presented in a final hydrology report for this to be considered by WRMA. • BO informed PKS that 1000m3/day is a preliminary figure however there could be a difference of +/– 20%. • *DO raised the issue of our development being limited as our property sits south of the Groundwater catchment area (GCA).* • PKS informed all that the purpose of the GCA is to control the development of groundwater and that WRMA is there to ensure that water resources are conserved. • PKS also informed all that this would also need to be discussed with other relevant stakeholders • *DO reported that surface run-off may not be too dirty and raised the question of artificial recharging and whether this would be considered and whether the total water abstraction could be negotiated*. PKS responded that a policy for artificial recharging is currently being developed, however if it is possible this can be negotiated. BO/DO to follow up on artificial recharging document/policy. • *DO raised the question of effluent quality*. PKS responded that discharge control is under the jurisdiction of WRMA and that an effluent discharge permit is required. PKS also informed all that an environmental discharge control plan (ECDP) is also critical prior to applying for an abstraction permit. • CR requested for clarification on whether the EDCP would come in a separate report. • PKS clarified that an environmental discharge control plan for handling all wastewater needs to be submitted through a separate report. • *BO raised the question of deterioration of quality/quantity of water in the Limuru area*. PKS responded that monitoring of water has not been implemented/established as yet however he confirmed that the area is not being abstracted heavily. PKS also reported that in terms of quality there would not be much change. • PKS also informed all that there is a borehole in Limuru near to the District Commissioners offices which has and is currently still	DO DO DO PKS DO DO PKS BO DO PKS PKS DO/PKS/ BO DO PKS CR PKS BO PKS PKS	

	being monitored. PKS reported that the levels have not dropped significantly since 2005. • PKS also informed all that the water demand would depend on the population, and currently Limuru does not have significant development.	PKS	
3.0	**AOB**		
4.0	**Actions**		
4.1	DO/BO to follow up Policy/strategy in relation to artificial recharging	BO/DO	10.05.13
	End of Minutes		

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P O Box 188, Sarit Centre 00606 Nairobi Kenya.
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Website : www.planning-kenya.com

Reference: 13.02

Redcoral Development/ Intex Development/ Kenya Power & Lighting Co. Ltd.

22/11/2013 Howard Humphreys – First Floor Board Room

Attendees:	**Initials:**	**Company:**	**Position:**
Charles Kalya	CK	The Kenya Power & Lighting Co. Ltd.	Limuru Branch Business Head
Christopher Omwega	CO	The Kenya Power & Lighting Co. Ltd.	Chief Engineer – Nairobi West
Peter N. Kamau	PNK	The Kenya Power & Lighting Co. Ltd.	Design Engineer
Kostas Alexandrou	KA	LDK Consultants	Mechanical Engineer
David Komen	DK	Howard Humphreys	Electrical Engineer
Cameron Rush	CR	Planning Project Management Ltd.	Director
Chris Childs	CC	Planning Project Management Ltd.	Assistant Project Manager

AGENDA

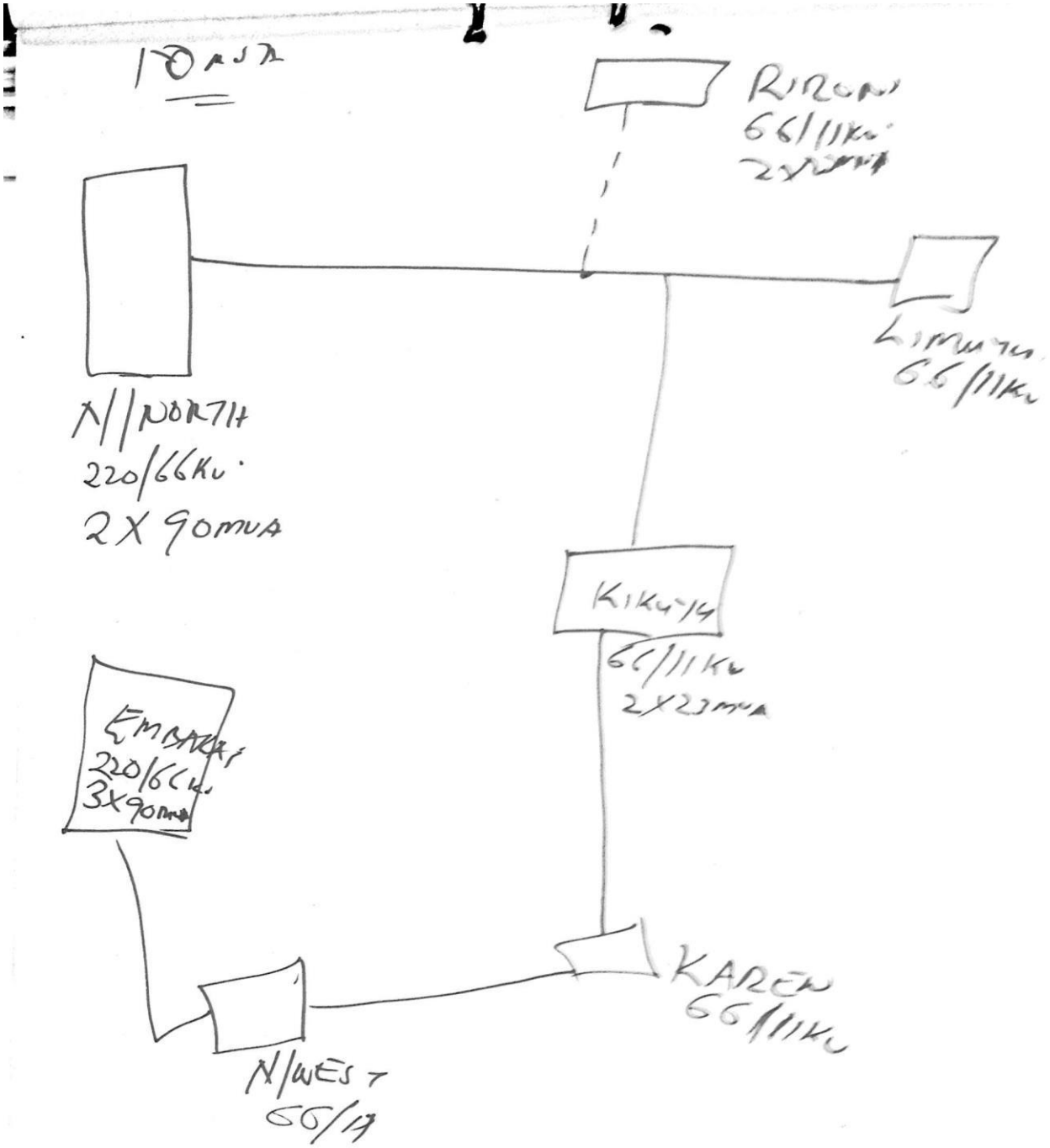
1. Introduction
2. Supply options for both Redcoral and Intex Developments
3. Possible location for the erection of a substation
4. Possibility of supply from the Rironi and Limuru Substations amoung others
5. Possibility of Cost sharing with KPLC
6. AOB

Item	Description	Action	Timeline
1.	**Introduction**		
1.1.	CR commenced the meeting by proposing brief introductions from those present.		
1.2.	CR and KA provided a brief background on the two developments and their respective power demands.		
1.2.1.	CR explained that Redcoral is a 387 Acre proposed development in Limuru with an anticipated power demand of 67 MVA.		
1.2.2.	KA explained that INTEX was an approximately 180 Acre development adjacent to Redcoral, with an anticipated power demand of 11 MVA.		
1.2.3.	KA highlighted that the overall power demand for both sites combined would likely be in the region of 60 – 65 MVA.		

2.	**Supply options for both Redcoral and Intex Developments.**		
2.1.	CO explained that the developments could be supplied and metered in any one of three ways; either at 132 KV, 66 KV or 11 KV.		
2.2.	KA indicated that Intex were intent on being metered at low voltage due to the added complication of managing distribution within the site.		
2.3.	CR indicated that Redcoral were yet to finalise a strategy and would be willing to consider being metered at either medium or low voltage.		
3.	**Possible location for the erection of a substation.**		
3.1.	This agenda item was not discussed as it was not seen to be relevant at this juncture.		
4.	**Possibility of supply from the Rironi and Limuru substations amoung others.**		
4.1.	CO explained that, when determining a power strategy, considering only the capacity of the Limuru and Rironi substations was not in itself sufficient. Instead, attention should be given to the power grid as a whole; in particular the capacity of the Nairobi North transmission substation. CO indicated that given the demand a further 90 MVA transformer may be required at the Nairobi North Substation.		
4.2.	PNK gave an overview of the power network in the area, illustrated by the sketch shown in Appendix A.		
4.3.	CK and CO suggested that as a way forward, both Intex and Redcoral should submit a formal application to KPLC giving a detailed breakdown of the demand, broken down in relation to the phasing of the developments. This would enable a strategy to be established in line with KPLC's own development programme. CK and CO indicated that it would be preferable to for each development to submit a separate application at this juncture.	CR, CC, KA, DK	TBC
5.	**Possibility of cost sharing with KPLC.**		
5.1.	This agenda item was not discussed as first it will be necessary to come up with a proposed strategy.		
6.	**AOB.**		
6.1.	PNK requested that that he be sent a map, illustrating the location of the developments.	CC	22/11/2103
	End of Minutes		

Appendix A:

Sketch of existing power network servicing the area.



MINUTES OF LIMURU MUNICIPAL PHYSICAL PLANNING LIAISON COMMITTEE MEETING HELD ON 27TH JUNE, 2013 AT MUNICIPAL COUNCIL CHAMBER'S AT 10.00AM

PRESENT

1. Kangethe Thuku	District Commissioner- Limuru (Chairman)
2. Mary N. Kamunyu	District Surveyor- Kiambu
3. Kamau J.H.M	District Lands Officer-Kiambu
4. Hannah N. Maranga	District Physical Planner (Secretary)
5. S.K Adika	District Water Engineer
6. Njoki Mukiri	District Environment Officer-Kiambu
7. Francis Ndirangu	Sub-County Administrator (Clerk Municipal)

IN ATTENDANCE

1. James Yatich	District Public Health Officer
2. John M. Maringa	District Agriculture Officer
3. Henry Mwau	Red Coral Properties (Consultant) LR.11532
4. Kavit Shan	Red Coral Properties LR. 11532
5. Cameroon Rush	Red coral properties (Consultant)
6. Ranee Nanj	Red coral properties
7. Ruth Gichuru	Red coral properties (consultant)
8. Leena Gehlot	Equico one LR. 11164/5
9. Eva Biegon	Equico one LR. 11164/5
10. Alkis Kalomparis	Equico one LR. 11164/5
11. Mark Nderitu	Municipal Works Officer
12. Joyce Kariuki	Deputy Public Health Officer
13. Charles Wahogo	Limuru Water & sewerage company
14. Timothy Dorongo	Equico one Ltd (consultant)

Items of Agenda

- Chairman's Remarks.
- Confirmation of previous minutes.
- Matters arising.
- Appeal for a review of an approved development on LR. 11164/5 due to blocked access to LR.11532.
- Proposed change of user on LR. 11532 from Agricultural to comprehensive mixed use (Residential, Commercial, Light Industrial, Education, Recreational and Public purpose.

Chairman's Remarks

The meeting started at 11.00am with a word of prayer by the District Surveyor. The chairman requested the members for self introduction. He requested the non-members to give room for the members to confirm the previous minutes.

Confirmation of the previous minutes of 7th May 2013

After the secretary took the members through the previous minutes, they were proposed by the water engineer and seconded by the lands officer.

Min. 1/6/2013 – MATTERS ARISING

- The District surveyor informed members that she did write to the Director of surveys notifying him on the omission of the footpath for purposes of amendment. However, she is yet to get the response. She was requested to do a followup.
- The secretary informed members that she did write to the commissioner of lands to put on hold the final approval of change of use on LR.11164/5 awaiting the determination of the access road.

The chairman then called in the other members. He informed members that the main agenda was to conclude the matter regarding the appeal by Red coral properties Ltd of blocked access to their land LR. 11532 by the approved development on LR. 11164/5 owned by Equico one.

He stressed to the members that the issue has been a subject of discussion in the two previous liaison meetings. The committee had made a decision of requiring all parties abutting the 7ft wide footpath to provide a further surrender of 9m so as to achieve a total road reserve of 20m.
However the two parties had during the meeting of 7th May 2013 requested for an opportunity to deliberate amongst themselves and forward their decision to the committee. The committee out of goodwill granted the request and advised them to report back within six weeks, hence the reason for the day's meeting.

Min. 2/6/2013 – Progress report

The Red coral representative presented as follows;

- That the two parties had agreed to explore two options;
  (a) Realigning the 7ft access to be at the current junction of redhill and Limuru road.
  (b) Land reimbursement.

On the first option the presenter informed members that a proposed design on the re alignment had been done and presented to Equico one ltd.
On enquiry by the members it emerged that the two parties have not agreed on the proposal since they were still in consultation.
The representative of Equico one Ltd on the other hand acknowledged some discussions have been made though no conclusions have been made.
She further added that they had lodged an appeal to the National liaison committee.
The appeal letter was dated 9th May, 2013.

However on discussion the application for the appeal was ruled out of order since the Municipal Planning Liaison committee decision had been held in abeyance after their previous request. The matter was therefore still with the municipal liaison committee.

Equico one ltd requested to be given more time to discuss the issue. They further requested the other party to withdraw the application to which the Red coral declined.

The town administrator (clerk) informed the parties that there are so many changes taking place in the county during the transition period. It is therefore important for the parties to finalize on their pending issues to avoid their developments being locked out.
He stressed that the liaison committee is a subjudicial committee mandated to undertake planning decisions and hence it should not be taken for granted.
He further highlighted that road widening and road provisions are issues that the office of the Governor has taken up seriously and he has insisted that roads should.

On being probed to give their closing remarks, Equico one ltd requested to have a moment to consult with their legal team. After their consultations, they informed members that they have agreed in principal that they will provide the access. The details on the size and position of the same will be discussed with the other party.

Members felt that the request to hold the matter further in abeyance is not justified considering the following;

- That the parties had seven weeks to deliberate and present a way forward to the committee. Very minimal discussion had taken place.
- The fact that one party had already lodged an appeal shows no goodwill for negotiation.
- The parties did not take seriously the good will exhibited by the liaison committee.

After healthy deliberations the committee unanimously resolved as follows;

1. No further extention to the period of deliberation as requested by the parties.
2. The committee upheld its decision as per the meeting of 11th April, 2013 requiring the provision of 20m road of access. This requirement will be effected on all development applications presented within the affected area.

The chairman however informed the parties that they were free to continue with their consultations in their private capacity.

Min. 3/6/2013 – Proposed change of user on LR. 11532 from Agriculture to comprehensive mixed use (Residential, commercial, Light industrial, Education, Recreational & Public purpose).

The chairman informed members that the Red Coral Properties had made an application to the municipal council for change of use on their 387acres piece of land.

Considering the magnitude of the area under consideration, the secretary advised the applicant to have it discussed at the liaison for a comprehensive technical input.

The chairman then called Mr. Henry Mwau of Realplan Consultants who was the planning consultant of the client to make presentation on the project.

The planner informed members that the land use plan being presented is a structure plan indicating major land use zones. The implementation process will be phased out. During each phase a detailed land use plan will be submitted for approval before the approval of the buildingplans. He said that the objective of the developers is to create a project consisting of housing, commercial, and light industrial developments complete with essential amenities.

The planner made a detailed presentation with the following highlights;

1. Background information - Location –Along Tigoni Road.
-Ownership status. (Red coral properties ltd)
-Tenure (leasehold and Agricultural).
-Acreage -387acres.

2. Structuring elements : Nairobi-Nakuru highway to the south-west.
Limuru-Ruaka road to the North.
Kabuku River to the South-West.

3. Water supply -Two boreholes existing on site. However the yield discharge is yet to be established.
The chairman sought to establish the current status of the distribution tanks and the piping network that belong to the Rironi water company which is a community water project.
The Red coral responded that the company has been in consultations with the water company and they have agreed the tanks be relocated to appropriate sites. The water engineer informed members that the community has identified an alternative site, but they need to be given ample time to set up the distribution point before Red coral can disconnect the community supply.

4. Proposed land uses

1. Residential (69.93ha)
   (a) High density (20.61ha) to be located on the lower side near the industrial zone. It will comprise of flats and Maisonettes with a plot density of 16 units per acre.
   (b)Medium density (17.80ha) –To be located on the upper and Middle zone to constitute of single dwellings of four units per acre.
   (c)Low density (25.31ha): To be located within the middle zone to constitute of single dwellings of four units per acre.
2. Commercial (16.33ha) Proposed hotel, commercial centre and retail outlets.
3. Industrial (36.831ha) These will comprise of light industries located at the far lower end of the plan.
4. Public facilities (1) Educational –Primary & secondary school provided on 8acres.
   (2)Health -1 acre reserved for a health centre.
5. Recreational - 4.3 acres reserved for a recreational park.

6. Transportation	-Provision made for a Bus park, filling station and road network.
7. Public utilities	- Power wayleaves provided. - Solid waste transfer station provided. - Sewerage system: The planner informed members that due to gradient of the land, the proposed development cannot be connected to the existing sewerage system. The proposed development has given provision of three(3) waste water treatment plants. The three sites will be serving residential, commercial and industrial zones differently. - Water tanks provision done.

The planner informed members that from the above presentation the plan provides for adequate public amenities.
The planner further informed members that the following reports will be submitted on approval of change of user;

- Traffic management plan.
- Environmental impact assessment study report.
- Subject area plans for detailing planning of the individual neighborhood.

In addition Mr. Cameroon who is the project manager informed members that a consortium comprising of consultants from various displines have been working on the project. The team has been inconsultation with WARWA, KENHWA and NEMA and a baseline environmental study has been done.

The chairman called upon the members for their critique.

- The District water officer informed members that out of the existing two boreholes, only one is functional after one was closed down due to its minimal discharge. The functional borehole has a discharge of 1.1m³ per hour. This supply cannot meet a demand of expected population of 6000 plus people.
  The applicant in response informed members that a preliminary hydrological report carried out indicate that the aquifer can allow for sinking of an extra borehole. However the water engineer was in dispute of this since previous research have proved otherwise.
- The chairman proposed provision of a police post towards the lower side next to industrial zone.
- Solid waste management. The council and the public health officer stressed the need for an integrated waste management plan where waste is separated at source to reduce the amount that goes to the dumping site.
  There is also the need to increase the number of solid waste transfer stations due to the expansiveness and gradient of the land.
- Community facility to be located within one of the recreational centres.

After a healthy plenary session, the chairman requested the Red Coral team to leave so that the members can further deliberate and make a decision.

Members discussed the proposal further. They unanimously approved the application subject to the following;

1. Provision of the 20m access road as per the recommendation of the previous liaison committee. The connection to Limuru road should be clearly mapped out. This will be achieved through surrender of 9m on both sides of the pathway.
2. The land use plan to clearly indicate the sewer treatment plants.
3. Increase the solid waste transfer stations to three sites.
4. The land users to be labelled as per the physical planning handbook e.g. the works to read industrial sites/parks.
5. A fully E.I.A. to be carried out and approved before any development.
6. A hydrological report to be submitted to the water engineer to assess the water demand and explore other alternatives.
7. A detailed land use plan to be submitted for approval at every stage of detailed development.
8. The land use plan to be amended to reflect the recommended changes and to be submitted to relevant agencies for endorsement.

The above resolution was communicated to the applicant to which he had no objection to. They thanked the members for their support and promised to work closely with all agencies of the government.

There being no other business, the meeting ended at 3.00pm with a word of prayer by the secretary.

Complied by.....Date.....
(Secretary)

Confirmed by.....Date.....
(Chairman)

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KIAMBU

Telegraphic Address
'Governor' Kiambu
Tel: 067 20374
E-mail: kiambucountygovernment@gmail.com
When replying please quote Ref No. & Date

Planning & Development
County Gov't of Kiambu
P.O Box 2344-00900
KIAMBU, KENYA

Date: April 4th, 2014

Form P.P.A.2 **PHYSICAL PLANNING ACT (CAP 286)** **APP.REG.NO.PP/01/2014**

NOTIFICATION OF APPROVAL/REFUSAL/DEFERMENT OF DEVELOPMENT PERMISSION

To:

REAL PLAN CONSULTANTS,

P.O. BOX 39542-00623,

NAIROBI.

Your application submitted on:	24th June, 2013
For permission to:	Change use from Agricultural to mixed use (Residential Bungalows, Maisonettes & Flats Education, commercial, light industrial, Recreation and other public facilities)
On Parcel L.R No(s):	LR. 11532
Situated in:	Limuru Sub-County
Road:	Laini-Limuru
Has been approved/ Not Approved:	Approved
Approved on (date):	**4th April 2014**
Approved by:	Limuru Sub-County

Subject to the following conditions:-

1

(a) Prepare and submit a detailed master plan for the entire project and submit this as part of the development plan for the project which will detail the character and type of roads, public utilities, standard of construction and maintenance of the roads, water supply, sewerage works and drainage system. The master plan should include the implementation phases of the project; and

(b) Undertake a full Environment Impact Assessment study report and approval of the same before commencement of development; and

(c) Submit a detailed spatial layout for each phase/zone of the land use plan detailing the road network, plot densities, accompanying public utilities and public purpose land uses; and

(d) Submit a comprehensive infrastructure report; and

(e) Submit a comprehensive hydrological report; and

(f) Submit an integrated solid waste management plan; and

(g) Obtain approval from all relevant authorities; and

(h) With respect to the land set aside for public amenities –

(i) such land should only be developed for that purpose in accordance with the approved land use plan and within the specified timeframe; and

(ii) construction of the infrastructure (roads, water supply, drainage and sewerage works) should commence before any private development for each phase and be complete on or before completion of the private development for each such phase; and

(iii) any other public amenities indicated in the approved land use plan should be completed along with the private development for each phase; and

(iv) the conditions in sub-paragraphs (i) to (iii) above shall be binding upon the Applicant and its successors and assigns and certificates of occupation in respect of each phase shall not be issued where the construction of the public amenities have not been completed; and

(v) the Applicant and its successors and assigns shall, on failure to comply with sub-paragraphs (i) to (iii) above, be required to transfer, free of charge to the County Government of Kiambu, any land reserved for such purpose; and

(i) The 9m road surrender should be aligned along the 7ft footpath that connects to the junction of Limuru-Laini road (D 407).

H. Maranga
For: Sub-County Administrator
Limuru Sub-County

c.c

- The National Land Commission-Nairobi
- The Land Registrar- Nairobi
- The Director of Physical Planning – Nairobi
- The Director of Surveys- Nairobi
- County Executive Member,

  Planning & Development - Kiambu

12.3 SEA Terms of Reference

Strategic Environmental Assessment of the Proposed Red Coral Development in Limuru, Kiambu County

Terms of Reference

10442K-GTR-H-0001

June 2014

Rev. 0

Consultant:
Howard Humphreys (East Africa) Limited
Howard Humphreys House
Muthangari Drive, Off Waiyaki Way, Westlands
P. O. Box 30156 - 00100
NAIROBI.
Tel: +254 20 4445254/6

Client:
Red Coral Properties Limited
P.O. Box 39542 - 00623
Nairobi

REVISION RECORD SHEET

This page is a record of all revisions, if any, made to the attached document. The revisions are listed under "Revisions/Changes". The revisions are part of the document and override the corresponding parts of the original document.

Revisions/Changes:

Remarks: Issued to NEMA for Review

Client:	Red Coral Properties Limited						
Project:	Strategic Environmental Assessment of the Proposed Red Coral Development in Limuru, Kiambu County						
Title	Terms of Reference for the Strategic Environmental Assessment of the Proposed Red Coral Development in Limuru, Kiambu County						
Doc. No.	10442K-PSD-H-0001	**Rev:**	0	**Date:**	**Orig.**	**Check.**	**Appr.**
Attachments	Entire Document		√	June 2014	SNW	AIW	WSA
	Revised Pages Only						

Note**:** ***This page and all its contents are NOT part of the document.***

Contents

1. Background

The Plan Proponent – Red Coral Properties Limited (RCPL) - is in possession of a 387-acre parcel of land on the outskirts of Limuru town and is desirous of developing the land to meet the growing demand for housing, commercial and light industrial developments away –yet proximal to the Nairobi City Centre. RCPL has thus commissioned a Strategic Environmental Assessment (SEA) of the proposed development's master plan.

The overall goal of the SEA is to ensure that environmental and social considerations are included in the planning, implementation and operation of the Red Coral Development.

The objectives of the SEA are to:

- Identify, describe and assess the likely significant environmental effects of implementing the plan;
- Integrate stakeholders' socio-economic and environmental perspectives into the proposed land use plan;
- Provide information to better integrate environmental considerations into decisions, implementation, and monitoring in order to minimize risks to the plan and risks emanating from the plan;
- Assess alternatives and options that can improve the land use plan; and
- Provide strategic-level recommendations on how to minimize potential negative effects & optimize positive effects.
- Provide prescriptions for the development of specific activities proposed for the various zones.

The SEA is consistent with the Strategic Environmental Assessment (SEA) approach applied by NEMA and is organized in two phases: Phase 1 – Scoping, and Phase 2 – the Study, which is more detailed. During the Scoping Phase, one of the preliminary activities was to carry out a stakeholder analysis to identify the stakeholders who should be consulted during all stages of the SEA. During the Scoping Phase, stakeholders provided input to:

- Identify main issues & concerns (to be further studied during the detailed SEA);
- Identify other key stakeholders;
- Select the SEA objectives (i.e., the evaluation framework);
- Select alternatives (to be assessed during the Analysis Phase of the SEA); and
- Identify data sources and data gaps, and provide input to the type of methodology to be used during the detailed SEA study.

2. Objectives

The overall objective of these Terms of Reference (ToR) is to ensure that the Strategic Environmental Assessment (SEA) is applied to integrate environmental and social considerations into the proposed plans in a manner consistent with Kenya's environmental laws and regulations and international environmental and social safeguard policies.

3. Link between the SEA and the Master plan Options

The SEA will contribute to the planning process in the following ways:

- It will help to refine the master plan options by assessing how the plans address environmental and social priorities associated with current patterns of land use. Gaps identified through this assessment will lead to adjustments in the master plan options to close the gaps.
- The SEA would produce an Environmental and Social Management Framework that will outline the procedures to be followed for managing potential environmental and social impacts of specific actions and projects during the implementation of the plans that are finally selected.

4. Strategic Environmental Assessment

These ToR specify the activities the Consultant will undertake for the SEA in line with the NEMA guidelines for SEA.

4.1 Scoping

Scoping studies have been carried out to establish the focus and content of the SEA and the relevant criteria for assessment. During the studies, an extensive stakeholder analysis was carried out to identify key stakeholders and establish their concerns and priorities in regard to the proposed development. This culminated in a Scoping Report submitted to NEMA for approval. Notwithstanding the previous stakeholder analysis, the Consultant at the start of the SEA study shall conduct a stakeholder gap analysis to identify any relevant stakeholders that might not have been considered during the prefeasibility and scoping phases of the development. The consultant shall then prepare a comprehensive set of consultation and participation activities for the SEA and review the consultation and participation plan previously prepared.

4.2 The SEA Study

4.2.1 Collection of Baseline Information

Partial baseline information has been collected on the site and the surrounding area from a range of information sources, including site investigations, government websites and publications, and thematic publications and reports on the plan area. The information collected covers the physical, biological and sociocultural/economic environment of the surroundings. However, gathering data is a process, and new data may become available or collected during the SEA process. Baseline data collected and to be complemented in subsequent data gathering activities will ensure that the resilience, vulnerability, and significance to human wellbeing of the local ecological systems and services is understood. The existing environmental protection measures and/or objectives set in international, national, or regional legislative instruments will be outlined and reviewed. In addition compliance of the master plan with the relevant national and regional legislation, guidelines, and objectives will be assessed.

4.2.2 Identification of key environmental and social issues

The Consultant will identify key environmental and social issues associated with the proposed master plan/development to inform the selection of environmental and social priorities. This identification of key issues will be based on analytical work using matrices and multi-criteria analysis.

4.2.3 Selection of environmental and social priorities

The scoping studies and stakeholder consultations have identified a number of issues that may constrain the Plan or opportunities where the Plan could contribute to or improve environmental value or quality. These shall form the key focus of the SEA study. They include:

- Development and land-use planning
- Water Resource use
- Nuisance from construction activities
- Interference with community assets such as the community water project
- Energy supply and usage
- Site Access from the A104 Nairobi –Nakuru Road, the C62 – Limuru Road, and the D 378 – Ngecha Road.
- Waste management

In line with the consultation and participation plan of the SEA, these key environmental and social issues resulting from the analytical work shall be reviewed and prioritized in a stakeholders forum to be organized by the plan proponent. It is expected that the stakeholders will agree on a common set of priorities at this forum and a report on the selection of priorities by the SEA stakeholders shall then be prepared.

The stakeholders to be consulted shall include:

- The neighboring residents and institutions; Consultations with the neighboring residents and institutions will mainly focus on potential impacts of the proposed plan on what this group of stakeholders consider as community assets as well as impacts on their health, safety and repose
- The local authority i.e. Kiambu County Government: Consultations with this stakeholder will enable the outlining of their priorities at a local physical planning perspective
- Limuru Water and Sewerage Company (LIWASECO): This stakeholder will provide inputs with regard to the water supply and sewerage scenario within the locality, proposed plans and possible constraints
- Kenya Power: this stakeholder will provide inputs with regard to the power supply scenario in the locality, ie the existing supply, infrastructure, proposed upgrades and possible constraints
- Water Resource Management Authority (WRMA); This stakeholder will provide inputs on the water resource development controls in the area and how the development can conform to these controls

- Kenya National Highways Authority (KeNHA)/KeRRA; This stakeholder will provide insights on how traffic in and out of the site will be managed including design standards for connections to the existing national/rural roads
- The National Environment Management Authority (NEMA) – Kiambu County: This being the regulator in environmental management matters, their inputs in regard to what are the acceptable standards/adequate mitigation plans will be sought besides providing insights on other regulatory requirements

4.2.4 Assessment

The Consultant will assess environmental and social sustainability of the master plan options against the identified stakeholder priorities. The extent to which candidate master plan options address the SEA's environmental and social priorities shall be determined, gaps identified, and specific recommendations made to refine the options to close those gaps. In this way, priority environmental and social considerations will be integrated into the preparation of the master plan.

The revised master plan shall also be assessed against the environmental and social impacts that it may induce or create during its implementation. These environmental and social impacts will be identified *vis-a-vis* the national and international environmental and social safeguard policies and recommendations including prescriptions made to eliminate or minimize the adverse impacts. Where some residual risk(s) still remain, these shall be dealt with in the Environmental and Social Management Plans to be prepared during project-specific Environmental Impact Assessments.

4.2.5 Preparation of the Draft SEA Study Report

A Draft SEA Study Report shall be prepared detailing the proposed plans and objectives, the findings of the study including alternatives that were studied, the selected option, the affected area, the environmental analysis, the impacts expected, the mitigation and enhancement measures, and the proposed monitoring program. The Draft Report shall then be submitted to NEMA in the prescribed format and accompanied with the prescribed fees for review.

4.2.6 Validation of the assessment

Following NEMA's review and public review and comments, the Consultant shall amend the Draft Report and organize a validation workshop whereby the key stakeholders shall be invited to review and validate the amended Draft SEA Report. The Consultant will then prepare a Final SEA Report in the prescribed format and submit to NEMA for approval.

4.2.7 Monitoring and evaluation

The Plan proponent shall monitor the plan during implementation and submit reports at regular intervals to NEMA. Monitoring shall enable a determination of the extent to which environmental and social objectives/recommendations made in the SEA are being met. At the end of the plan implementation, evaluation will be carried out to determine whether the SEA led to sustainable plan design and implementation.

4.3 Schedule and Deliverables

Table 1 below summarizes the main activities, deliverables and schedule for the implementation of the SEA process.

Activity	Timeframe	Deliverables
Prefeasibility studies	Already carried out	Environmental Assessment, Water supply, power supply assessment reports, traffic and transportation studies reports
Preparation of Plan Brief and submission to NEMA	Already carried out	Plan Brief
Scoping studies and preparation of a Scoping Report	Partially complete pending approval of ToRs. Estimated 1 week	Scoping Report including ToRs
SEA Study	1 week	
Collection of baseline information		
Identification of key environmental and social issues		
Stakeholder engagement and identification of priorities	2 weeks	
Evaluation of priorities against sustainability criteria		
Preparation of a Draft SEA Report and Submission to NEMA for review	2 weeks	Draft SEA Report
Stakeholder Reviews (Public, Lead Agencies and Expert Committee)	9 weeks	Corrections on the draft SEA Report
Amendment of Draft SEA Report and presentation in a validation Workshop	2 weeks	
Preparation of Final SEA Report and submission to NEMA for approval	1 week	Final SEA Report
NEMA Review and Approval	9 weeks	SEA License
Plan implementation including EIAs of specific projects in the plan	Within the SEA license validity period	Project Specific EIAs

4.4 The SEA Team

The SEA team that will be involved in the Study shall include:

- Arundhati I-Willetts – SEA Team Leader/Environmental Expert (Reg No 0051)
- Simon Wandeto – Environmental Expert (Reg No. 0885)
- Kennedy Kijana – Environmental Expert (Reg No. 1254)
- Lawrence Njue – Environmental Expert (Reg No. 0781)
- Lydiah Njeru – Sociologist

Other consultants who may be called upon especially during the SEA workshops include

- Bernard Ochieng – Water and Sanitation Engineer
- George Muriithi – Water Engineer
- David Komen – Electrical Engineer
- Geoffrey Mwangi – Roads Engineer
- Henry Musangi - Architect

Appendix 1: Curriculum Vitae of the Proposed SEA Team

CURRICULUM VITAE

Name:	**Arundhati Inamdar-Willetts**		
Profession:	Environmental Management Consultant		
Address:	PO Box 66629 – 00800 Westlands, Nairobi, Kenya Cell: +254 722 25 99 99 email: willetts@iconnect.co.ke		
Date of Birth:	15th November 1960	**Nationality**:	Kenyan
Years with Firm:	Independent Consultant	**Total Experience**:	>25 years

Membership inProfessional Societies:
Associate Member of the Institution of Chemical Engineers, UK.
Member, Institution of Environmental Sciences, UK.
Associate Member, Institute of Environmental Management and Assessment, UK.
Member, International Association for Impact Assessment.
Member, The International Ecotourism Society.

Other Societies:
Ecotourism Kenya, East African Wildlife Society, Nature Kenya.

Key Qualifications:
- **Chartered Environmentalist** (SocEnv).
- More than 20 years experience in **environmental impact assessment, environmental auditing**, **environmental planning and management**, mainly Eastern, Western and Southern Africa, and India.
- Conducted **over 40 EIAs** in the transportation (including roads), water, power, agriculture, manufacturing, building and tourism sectors.
- Team leader on **Strategic Environmental Assessments** for the transport/road sectors in Ghana, Uganda and Kenya, and for Biosciences east and central Africa (BecA - an agricultural bioscience research platform in Kenya).
- Conducted more than **20 environmental risk, compliance and due diligence audits** (clients include Magadi Soda Ltd, KenGen, SGS and CDC-Actis).
- Participated in **ISO 14001** implementation, surveillance and certification audits for private industry.
- **Conducted environmental awareness training** for ISO 14001 requirements, as well as **awareness training** for road engineers, contractors, and planners.
- **Trained** young Kenyans "on the job" on **EIAs** and **environmental audits**.
- Prepared **EIA and sectoral environmental management guidelines** for the roads sectors in Kenya, Uganda and Tanzania, **Compensation and Resettlement Guidelines** for the road sector in Tanzania, and EIA guidelines for rural water supplies in Somaliland.
- Led institutional studies to set up environmental units in road sector ministries in Kenya and Uganda, and a study on the **restructuring and decentralization of NEMA**, Kenya.
- Involved in the **preparation of sector development programmes**, requiring coordination with bilateral and multilateral development partners (Danida, AfDB, EU and World Bank).
- Sociological and gender oriented assignments have included **social impact assessments**, **resettlement action plans**, and **gender action plans**.
- As team leader on several projects, managed teams of up to 20 people, coordinated research and directed team activities, collated and digested team outputs in order to produce project deliverables, liaised with government agencies and development partners, and managed project accounts.
- Good understanding of development partner **environmental and social safeguard policies**, including the World Bank (IDA/IFC), AfDB, EU, Danida, and JICA.

Education:
1982 BSc (Hons) Environmental Chemical Engineering, University of Exeter, UK.
1986 MSc Environmental Resources (Tropical Environmental Management), University of Salford, UK.
MSc dissertation on "Environmental Impact Assessment in India - An Approach for Public Participation in Environmental Appraisal".
Other Courses:

- Increasing tangibility in SEA through Valuation of Ecosystem Services (conducted by IAIA, Puebla, Mexico, May 2011)
- Contaminated Land Assessment and Remediation Course (Univ. of Manchester, UK, October 2006)
- Consultants and Clients PPS Training (conducted by IFC Nairobi, March 2006)
- Advanced Environmental Management Systems Lead Auditors Course (SGS UK, May 2002)
- Training of Trainers Course (October 2002)
- Introductory Training on Environmental Oriented Cost Management (October 2000)
- Impact of the Environmental Act on the Oil and Gas Industry (April 2000)

Registered Lead Expert with National Environment Management Authority, Kenya (Registration No. 0051).

Experience Record:

1992 to date: ENVIRONMENTAL MANAGEMENT CONSULTANT

Africa (2013 - ongoing): Environmental Specialist on an assessment of the implementation of the African Development Bank's **Involuntary Resettlement Policy** to enhance the design of their **Integrated Safeguards System**. Client: African Development Bank/Gibb International Ltd

Kenya (2013): Conducted "walk through" **environmental audits** of six camps in Naboisho Conservancy in the Maasai Mara to assess the visual impacts of the camps and report on **compliance with Ecotourism Principles**. Client: Naboisho Conservancy

Zambia (2012): Environmentalist/EIA Expert on the **rehabilitation of the 240 km long section of the Great North Road from Chinsali to Nakonde**. Responsible for advising the design engineers on environmental aspects to be included in the engineering design and construction works, preparation of the EIS and Preliminary RAP. Client: Road Development Agency/Grontmij A/S

Tanzania (2012): Member on a team providing **Technical Assistance** on behalf of DfID to the Prime Minister's Office Regional Administration and Local Government for the development to implementation stage of the second phase of the **Local Government Transport Plan**. Responsible for ensuring that **environmental impacts and climate change risks** are addressed in the plan. Client: DfID/PMORALG/ ITTransport

International (2012): Team member on **an evaluation of UNEP's Medium-Term Strategy** (MTS), responsible for assessing the strategic relevance of the MTS within the context of UNEP's vision and mission, its comparative advantage and current and emerging environmental challenges. Client: UNEP Evaluation Office, Nairobi.

Regional (2012): Peer reviewer for outputs of the Water Resources Development Projects under the Nile Equatorial Lakes Subsidiary Action Programme, to ensure that **environmental and social safeguards** are adhered to in project preparation and implementation. Client: Nile Basin Initiative/Nile Equatorial Lakes Subsidiary Action Programme

Uganda (2011-2012): Environmental Specialist on a study to evaluate the performance and impact of the second phase of the road sector development program (RSDP2), as well as the impact of institutional reforms; and also to **formulate the third phase of the road sector development program** (RSDP3). Responsible for assessing effectiveness of ESIAs and ESMPs in road sector development to date, and propose means to incorporate environmental management into RSDP3 activities. Client: MOWT/UNRA/Mott MacDonald

Tanzania/Kenya (2011): Environmental Consultant on a **project formulation study** of the Lake Victoria Water and Sanitation Initiative for Mwanza and Kisumu to increase access to clean water, particularly in low income areas, improve sanitation infrastructure including the collection and treatment of wastewater, and pollution in Lake Victoria resulting from urbanisation. Client: Matrix Development Consultants/WS Atkins/EU

Uganda/DRC (2011): Environmental Consultant assigned to prepare an **environmental and social assessment and management plan** for the Lakes Edward and Albert Fisheries and Water Resources Management Project. Client: Nile Basin Initiative/Nile Equatorial Lakes Subsidiary Action Programme/AfDB

International (2010-2011): Team member on an assignment to develop an **ecorating certification system** for the Global Ecosphere Retreats, as part of the Long Run Destination Programme of the Zeitz Foundation, involving auditing of potential candidate sites in Zanzibar, Costa Rica and New Zealand. Client: Conservation Development Centre/Zeitz Foundation

Regional (2010): Facilitator/Trainer at a workshop to train Nile Equatorial Lakes Subsidiary Action Program (NELSAP) project managers on Environmental and Social Procedures required for mainstreaming its **Environmental and Social Management Framework** into NELSAP Projects in the eight NELSAP member countries, vis. Burundi, DR Congo, Egypt, Kenya, Rwanda, Sudan, Tanzania and Uganda. Client: Nile Basin Initiative/Nile Equatorial Lakes Subsidiary Action Programme

Kenya/Ethiopia (2010): Consultant Environmental Specialist on an **AfDB Preparation Mission** for the **Timboroa-Eldoret Road** in Kenya, and **Kombolcha-Bati-Mille and Bedele-Metu Roads** in Ethiopia to establish the level of environmental impacts and make recommendations on the project to the Board. Client: AfDB

Ghana (2009-2010): Team Leader on a **Strategic Environmental Assessment** for the **Transport Integration Plan** covering transport by road, rail, maritime, inland water, air and pipeline. Client: EU/Ministry of Roads & Highways/Mott MacDonald

Ethiopia (2009): Environmental Specialist to review the **SIA and RAP for the Assosa-Dabus-Wombera** Road. Ethiopia Client: Nordic Development Fund/Ethiopian Roads Authority/CarlBro a/s.

Kenya (2009): RAP Trainer and **ESIA/RAP Report Review** for the **Olkaria IV Domes and Olkaria Units 4 & 5 Geothermal Projects**. Client: KenGen/Gibb Africa

Kenya/Ethiopia (2009): Consultant Environmental Specialist on an **AfDB Preparation Mission** for the **Rehabilitation of the Nacala Road Corridor Project** in Mozambique/Malawi **and the Mombasa-Nairobi-Addis Ababa Road Corridor Project** to establish the level of environmental impacts and make recommendations on the project to the Board. Client: AfDB

Kenya (2008-2009): Environmental impact assessments on three small hydropower projects in Kenya as part of the design for supply of electrical power to small and large tea factories. Client: EATTA/GTIEA/Graeme Watson Associates

Kenya (2008-2009): Team Leader on an assignment for the **restructuring and decentralization** of the **National Environment Management Authority**. Client: Danida/Sida/Euroconsult Mott Macdonald

Kenya (2007-2009): Environmental monitoring of the Embakasi-Machakos Turn Off and Machakos Turn Off to Sultan Hamud Roads. In charge of environmental monitoring of all works activities during construction, including the contractors camps, borrow pit excavation and liaison with District Environmental Officers. Client: World Bank/Nicholas O'Dwyer International/Abdul Mullick Associates

Kenya (2008): Carried out / involved in **EIAs for the 50 MW South Kinangop and 100 MW North Kajiado Wind Power Projects.** Client: Aeolus Kenya Ltd

Kenya (2008): Team Leader on an **environmental audit for the Biosciences Eastern and Central Africa/ILRI facility**. Client: ILRI / SGS

Ghana (2008): Carried out an **environmental due diligence assessment** on a project to harvest submerged timber from Volta Lake. Client: Actis

Tanzania (2007-2008): Task leader for the preparation of **Compensation and Resettlement Guidelines for the Roads Sector.** Client: Ministry of Infrastructure Development/Danida/Cowi A/S.

Kenya (2007): Environmentalist for General Motors Audit Services to ensure **legal compliance** and compliance with GM's **Global Performance Criteria**. Client: General Motors Ltd / Arcadis GMI

Puntland/Somaliland (2007): Team leader on an **environmental audit** for a **telecommunications** project. Client: FMO/Norken Ltd.

Tanzania (2007): Environmental Consultant. Carried out an **environmental risk assessment** on the **Kapunga Rice Project and Jatropha Plantation** with regard to the present site, and its current and proposed activities. Client: Actis

Kenya (2007): NEMA Compliance Audit for a tourist resort on Lake Victoria. Client: Musiara Ltd

Kenya (2007): Compliance audits on two tea factories. Lead auditor on a supplier audit to evaluate compliance on behalf of a beverage bottling company. Client: The Coca Cola Company/ArcadisGMI

Kenya (2007): ISO 14001 Phase I audit. Team Leader for the Phase I audit for an airline catering industry. Client: NAS / SGS Kenya Ltd

Uganda (2007): Environmental Specialist on a **pre-feasibility study for the Northern Corridor Route** to broadly examine all possible impacts resulting from the construction and operation of the project in relation to its environmental acceptability. Client: RAFU/EU/Jacobs UK

Kenya (2007): Preparation of a legal compliance checklist. Developed a legal register as a checklist to monitor compliance. Client: General Motors (East Africa)/ArcadisGMI

Kenya (2007): Consultant Environmental Specialist on an **AfDB Preparation Mission** for the **Nairobi-Thika Highway Improvement Project** to establish the level of environmental impacts and make recommendations on the project to the Board. Client: AfDB

Kenya (2007): Team Leader for an **environmental compliance and risk audit** at the **International Livestock Research Institute**, Nairobi. Client: ILRI/SGS

Rwanda (2007): Team Leader on an **EIA of a dairy and fruit juice processing plant** in Kigali. Client: Inyange Industries/SGS

Tanzania (2006-2007): SIAs and RAPs for the Singida-Babati-Minjingu and Dodoma-Babati Roads. Team sociologist responsible for addressing social impacts and preparation of resettlement action plans for both roads. Client: AfDB/World Bank/Carl Bro a/s

Kenya (2006): Environmental Technical Assistance to Roads 2000 Programme in Nyanza Province to facilitate the integration of environmental management into road improvement and maintenance works in 11 districts. Client: Ministry of Roads/I T Transport

Tanzania (2006): Conducted an **Environmental Audit** on the **Dar es Salaam Water Supply and Sanitation Project**, as part of an overall mid-term Technical Review. Client: Howard Humphreys (T) Ltd/World Bank

Kenya (2006): EIA for a proposed tourist lodge within an existing game reserve on a private ranch in Laikipia District. Client: Solio Game Ranch Ltd

Kenya (2006): EIA for a proposed conservancy with tourist accommodation facilities adjacent to the Masai Mara National Reserve. Client: Olare Orok Conservancy

Ghana (2006): ISO 14001 surveillance audit. Team Leader for the final surveillance audit for a **food and cosmetics manufacturing** firm. Client: Unilever Ghana Ltd / SGS Kenya Ltd

Puntland (2005): EIA for a proposed jetty at Las Qoray on the Gulf of Aden. Client: Horn Relief

Kenya (2005): Environmental Consultant on a preparation mission for **Small-Holder Horticulture Development Project**. Investigated environmental concerns of 14 potential small-scale irrigation schemes in semi-arid areas in seven districts in Kenya. Client: AfDB/GOK

Kenya (2005): Environmental audit for a **food microbiology laboratory** in Nairobi. Client: SGS Kenya Ltd

Rwanda (2005): EIA for an ecolodge at Kinigi at the foot of the Volcanoes National Park. Client: Governors Camp

Kenya (2004 - 2006): Biosciences East and Central Africa. Team leader for a strategic environmental assessment for a CD$30 million **bioscience research facility** at the ILRI campus in Nairobi. Client: CIDA/ILRI/BECA/PharmEng Technologies Inc.

Malawi (2005): EIA and SIA for Upgrading the Mangochi-Monkey Bay-Cape Maclear Road. Team environmentalist responsible for addressing environmental and social impacts due to the project. Client: National Roads Authority/HP Gauff Ingenieures

Kenya (2005): Environmental specialist on a mission to establish the feasibility of **small scale horticultural projects** in seven semi-arid districts**.** Client: ADB/Ministry of Agriculture/Carl Bro a/s.

Mauritius (2005): Review of the EIA for the construction of the proposed **corporate aviation facilities at the SSR International Airport for** acceptance by the Mauritius Environmental Agency. Client: Gibb Mauritius

Kenya (2005): Environmental compliance audit for three safari camps in the Masai Mara Game Reserve. Client: Governors Camp

Kenya (2005): Environmental compliance audit for a tourist lodge on Lake Baringo. Client: Baringo Island Camp Ltd

Tanzania (2004-2005): Preparation of Phase III of Danida's Road Sector Programme Support Environmental input to develop three components for Danida support to the road sector in Tanzania (2006-2010): Regional Roads, District Road Development and Village Travel and Transport. Client: Danida/I T Transport

Kenya (2004): Environmental compliance audit for a laboratory and warehouses. Client: SGS Kenya Ltd

Ghana (2004): Audit team member on an **ISO 14000 surveillance audit for a bauxite mine.** Client: Ghana Bauxite Company / SGS Kenya Ltd

Kenya (2004): Environmental Project Report for Eden Square, a commercial building in Nairobi. Client: Shamgro Ltd/Mentor Management

Kenya (2004): Environmental compliance audit for a pharmaceutical plant in Nairobi**.** Client: Cosmos Ltd

Kenya (2004): Environmental audits for the Nairobi Business Park, and the Junction Shopping Centre. Client: CDC-Actis

Kenya (2004): Environmental compliance audit for Magadi Soda Company. Team leader on an audit covering the existing Soda Ash Plant, Magadi Rail and the Mombasa Shed, to conform to NEMA's requirements for annual audits. Client: Magadi Soda Company / Norken Ltd

Kenya (2004): Advised **Kenya Breweries Ltd** on requirements for achieving ISO 14001 certification. Client: EABL / Gibb (Eastern Africa) Ltd

Kenya (2004): Olkaria II Geothermal Power Plant. Team leader on an assignment to prepare a **Project Report** for the installation of a third 15 MW unit, and an **Environmental Audit** on the existing plant. Client: KenGen / Gibb (Eastern Africa) Ltd

Kenya (2004): ISO 14001 Certification Audit. Audit team member on final certification audit for De la Rue. Client: SGS

Uganda (2003-2004) : EIA and SIA on the Upgrading the Soroti-Lira Road Team Leader for the environmental and social impact assessments, including the preparation of a Resettlement Action Plan. Client: Road Agency Formation Unit/HP Gauff Ingenieures

Kenya (2003-2004): Community Development for Environmental Management. Team Member on a mission for EU support to develop mechanisms for funding environment-oriented community initiatives, and for capacity building within the National Environment Management Authority. Client: EC/Arcadis Euroconsult

Ethiopia (2003-2004): Resettlement Action Plan for the Assosa-Guba and Babile-Fik Roads Team Leader. Responsible for developing survey methodologies and instruments, collation and analysis of data, preparation of RAP. Client: Nordic Development Fund/Ethiopian Roads Authority/CarlBro a/s

Kenya (2003): ISO 14001 Training on environmental awareness, environmental management systems and environmental auditing. Lead Trainer. Client: General Motors Kenya Ltd

Kenya (2003): EIA on the Embakasi – Machakos Turn Off Road. Team leader. Responsible for identification of environmental impacts, recommendations for mitigation and preparation of environmental management plan. Client: World Bank/MORPW/Norken Ltd

Kenya (2002-3): EIA for the Thika-Mague, Muthaiga Roundabout-Limuru and Machakos Turn Off- Ulu Roads. Team leader. Responsible for identification of environmental and social impacts, recommendations for mitigation and preparation of environmental management plan. Client: World

Bank/MORPW/Norken Ltd

Kenya (1999-2003): Environmental monitoring of 64MW geothermal power plant at Olkaria. In charge of environmental monitoring of all civil works activities during construction. Client: World Bank/ KenGen/ Sinclair Kingston Morrison/ Howard Humphreys

Kenya (2002) Waste management study, including an assessment of compliance against national legislation, identification of potential opportunities for waste minimisation, recycling and recovery. Senior Environmental Consultant. Client: General Motors / Arcadis GMI

Kenya (2002): Environmental scoping study for a truck loading facility for white oils at Kenya Pipeline Company's existing pump station in Mombasa. Team Leader. Client: Kenya Pipeline Company Ltd

Kenya (2002): Environmental audit for Magadi Soda Company. Team leader. Audited the existing soda ash plant, Magadi Railway and the Mombasa Shed. Proposed improvements and recommendations for an environmental management system. Reassessed impacts of the proposed Pure Soda Ash Plant. Client: Magadi Soda Company / Norken Ltd

Kenya (2002): Environmental scoping study for Gem Gen's run of the river hydroelectric power plant in Western Kenya. Team Leader. Established critical environmental and social issues, and TOR for a full EIA. Client: Africa Project Development Facility / Gem Gen Hydropower Company

Kenya (2001-2002): Assistance to General Motors to obtain ISO 14001 certification. Senior Environmental Consultant. Client: General Motors / ARCADIS GMI

Kenya (2001): Environmental scoping study for sugar factory and co-generation plant in Western Kenya Client: Busia Sugar Company/Carrington & Associates Agriculture Ltd

Ethiopia (2001): Feasibility study and EIA for the Assosa-Guba Road. Senior sociologist, responsible for conducting the social survey, public consultations and identification of social impacts, and corresponding mitigation. Client: Nordic Development Fund/Ethiopian Roads Authority/CarlBro a/s

Ethiopia (2001): Feasibility Study and EIA for the Babile-Fik Road. Team Leader for environmental and social impact assessment components. Client: Nordic Development Fund/Ethiopian Roads Authority/Carl Bro a/s

Tanzania (2001): **EIA of the Udekwa-Mahenge Road**, which traverses highly sensitive biologically diverse areas. Team Leader. Client: Danida/I T Transport

Tanzania (2000-2001): Study to establish buffering capacity of Lake Victoria Wetlands. Joint Acting Team Leader, responsible for project start up, initiating and coordinating field surveys, and specific inputs on wetlands management and training. Client: Lake Victoria Environmental Management Programme/GEF/ARCADIS Euroconsult

Kenya (2001): EIAs for the Nairobi Business Park and the Junction Shopping Centre in Nairobi**.** Environmental Consultant. Client: CDC Capital Partners

Zambia (2000): **Preparation of Danida's Road Sector Programme Support**. Team Environmentalist and Gender Specialist. Client: Danida/I T Transport

Kenya (2000): Roads 2000 Socio-Economic Baseline Study. Responsible for environmental input, survey instruments, overall quality control and report production. Client: Ministry of Roads & Public Works/Danida/Grabowsky & Poort

Uganda (2000): Environmental scoping study for the Northern Corridor Oil Pipeline for transportation of oil products from Tororo to Mbarara**.** Lead consultant. Client: Overseas Trade and Investment Services LLC/Madhvani International SA

Uganda (2000): EIA of Atiak-Moyo Road. Lead Environmental Consultant**.** Client: Ministry of Works, Housing and Communications/ Nicholas O'Dwyer Consulting Engineers

Kenya (1999-2000): Environmental audit of El Nino Emergency Projects. To assess procedures and mechanisms in work selection, implementation and supervision, quality, economy and efficiency of the works. Client: World Bank/PriceWaterhouseCoopers/Norconsult AS

Tanzania (1999): Preparation of Phase II of Danida's Road Sector Programme Support Environmental input to three components of Danida's RSPS in Tanzania (2001-2006): Regional Roads, District Road Development and Village Travel and Transport, covering Coast and Iringa Regions. Client: Danida/I T Transport

Uganda (1999): Environmental and Gender Action Plans for Danida support to the rural road component of the Road Sector Programme Support in Uganda. Team leader. Danida/I TTransport

Kenya (1999): Rural Roads Improvement in on three roads in Western Kenya. Lead environmentalist. Client: JICA/Norconsult AS

Zimbabwe (1999): Review of the Labour Based Rural Roads Rehabilitation Programme. Environmentalist and gender specialist. Client: DANIDA/I T Transport

Tanzania (1998-1999): Introductory Guidelines and Procedures for Environmental Management in the Road Sector. Lead Environmentalist/EIA specialist**.** Client: DANIDA/I T Transport

Uganda (1998-1999): Road Sector Environmental Policy and Management Study. Team Leader. Client: Ministry of Works, Housing and Communications/World Bank/ARCADIS Euroconsult

Kenya (1998): Northern Collector Project, Third Nairobi Water Supply. Environmental Consultant. Client: Nairobi City Council/Howard Humphreys

Kenya (1998): Rhamu-Mandera Road Preliminary and Final Design Study. Team environmentalist. Prepared EIA Study. Client: Ministry of Public Works & Housing/Norconsult AS

Kenya (1998): Network Environmental Risk Assessment to monitor environmental problems at 70 service stations throughout the country**.** Project Advisor. Client: Shell / Norconsult

Kenya (1998): Review of the Minor Roads Programme. Team environmentalist. Client: DANIDA/ I T Transport

Kenya (1997-1998): Setting up of an **Environmental Unit for the Roads Department.** Team Leader. Client: Ministry of Public Works & Housing/World Bank.

Kenya (1997-98): Sectoral Environmental Assessment for the Third Highway Sector Project. Team Leader. Client: Ministry of Public Works & Housing/World Bank

Kenya (1997-98): EIA of the Nairobi-Mombasa Road. Lead environmentalist. Client: European Commission/Grabowsky & Poort BV

Somaliland (1997): Environmental guidelines for rural water supplies. EIA Specialist. Client: IUCN/ EU/ Agrisystems

Uganda (1997): Environmental scoping for a 240 MW hydropower project at Bujagali Falls. Lead Environmentalist. Client: Nile Independent Power/AES Electric

Uganda (1997): EIA for Kabiranyuma Gravity Flow Water Scheme. Team Leader. Client: CARE-DTC

Kenya (1996-1997): Environmental Guidelines Manual for Rural Roads. Team Leader. Client: Royal Netherlands Embassy/Grabowsky & Poort BV

Kenya (1996-1997): Institutional framework study for environmental management in Kenya. Local environmental consultant. Client: NEAP/World Bank/EDC-Vamos International

Kenya (1996, 1997): Environmental site assessments for a chewing gum plant. Principal Consultant. Client: The Wrigley Company/Grabowsky & Poort BV

Kenya (1995): Water demand study to develop a water master plan for Gatuanyaga, Thika and Juja Locations. Team leader. Client: Plan International/Grabowsky & Poort BV

Kenya (1995): **EIAs for the rehabilitation and augmentation of four water supply projects.** EIA Specialist**.** Client: World Bank/Mangat IB Patel & Partners

Tanzania (1995): Tourism Infrastructure Project Feasibility Study. Lead Environmentalist. Studied impacts of improving infrastructure to major tourism destinations, eg water supply, sanitation, roads, airports, ports, power supply and telecommunications. Client: World Bank/Nicholas O'Dwyer/Vamos International

Tanzania (1994): EIA for the rehabilitation of Dar es Salaam Water Supply. Lead Environmentalist. Client: AfDB/Howard Humphreys

Tanzania (1994): Affordability and willingness to pay analysis for the Urban Sector Engineering Project. Consultant**.** Components included water supply, sanitation and roads in 5 urban centres. Client: World Bank/Howard Humphreys

Tanzania (1994): Environmental Site Assessment for Bottling Plant. Environmental Consultant**.** Client: The Coca Cola Company/Howard Humphreys

Kenya (1994): Country Environmental Strategy Paper on Water Resources in Kenya. Client: World Bank

East Africa (1993): Script for "Save the Bahari". Client: UNEP/Gone Fishing

Kenya (1993): Socio-economic aspects of the Taita-Taveta Water Master Plan. Client: Danida/ Norconsult AS

Kenya (1992): EIA for KWS Lodges and Camp Site Expansion Proposal. Client**:** Africa Expeditions Ltd

1987 - 1991: Norconsult International AS, Consulting Engineers, Nairobi. Environmental Planner

Kenya: Environmental Impacts of Rural Water Supplies. Client: SIDA

India: Women and Pollution Control Client: OSPCP Board/NORAD

Kenya: Rehabilitation of Earth Dams. Client: Kitui Integrated Development Programme

Tanzania: Feasibility Study for Mwamapuli-Bulenya Water Supply and Pilot Sanitation Study, Igunga District. Client: AfDB/Ministry of Water, Energy & Minerals, Tanzania

Kenya: Turkana District Environmental Study. Client: NORAD

Kenya: Review of Water Supply Projects. Client: RDF

Kenya: Reviews of the Agriculture & Forestry, Health & Education, and Livestock Sectors. District. Client: NORAD

Kenya: EIS for Polyethylene Container Plant Client: Kentainers Ltd

Kenya: Environmental Scoping Study, Turkana District Client: NORAD

Kenya: Chapter on Women and Rural Roads. Client: RARP/ NORAD

Kenya: Environmental Impacts of Cattle Dips. Client: DANIDA

Kenya: Women's Participation on Rural Access Roads Programme. Client: MoPW/NORAD

Kenya: Monitoring and Evaluation of Urban Water Schemes Client: MOWD/NORAD

Kenya: Marketing Study, Mutomo Division. Client: DANIDA

Kenya: Documentation Study, Turkwel River. Client: NORAD

Kenya: Documentation Study, Bungoma District. Client: NORAD

Uganda: Action Plans for Rural Development. Client: UNEP

1985 – 1986: Masters Degree, University of Salford, UK.
1983 – 1984: WORLD WILDLIFE FUND – INDIA , Projects Officer for Western Region

Languages:

English (excellent), Marathi (mother tongue), Kiswahili (good), French (fair), Hindi (fair), Italian (poor)

References:

Provided upon request.

CURRICULUM VITAE

Proposed Position: **ENVIRONMENTAL EXPERT**

Name of Firm: Howard Humphreys (East Africa) Limited

Name of staff: **WANDETO,** Simon Nguru

Profession: Environmental Management

Date Birth: 1981

Years with Firm: 5 **Nationality:** Kenyan

Membership in Professional Societies:

Lead Expert registered with the National Environment Management Authority (NEMA) Reg. No. 885.

Key Qualifications:

10 years consulting experience in Environmental Management conducting environmental impact assessments and audits for clients in diverse sectors of the economy; and strong background in Environmental Science and conservation biology, with knowledge in personal and occupational pollution, risk and hazard management, and Project Planning and Management.

Education:

Institution	Date	Degree (s)
University of Nairobi	2014	M.Sc Biology of Conversation
University of Nairobi	2007	Post Graduate Diploma: Project Planning and Management
Kenyatta University	2004	B.Sc. Environmental Studies (Science)

Employment Record:

September 2009 to Date Howard Humphreys (East Africa) Limited

Senior Environmentalist

Name of assignment or project: Environmental, Occupational Safety and Health, and Fire Audit of Safaricom Facilities

Year: 2014

Location: Country wide

Client: Safaricom Limited

Main project features: Environmental, occupational/public health and safety audit, and Fire Audits

Positions held: Project Manager/Environmentalist

Activities performed: Coordination of environmental, occupational safety and health, and fire audits of Safaricom's Head Offices, Retail Centres and Switches/Mini – switches

Name of assignment or project: Environmental Audit of Light Forces Training with Support Helicopter in Kenya for the British Army Training Unit in Kenya (BATUK)

Year: 2013 - 2014

Location: Kifaru Camp (Kahawa Barracks), Various Private Ranches within Laikipia County, Archers Post in Samburu County and Kathendini (Mt Kenya Forest Reserve) in Kirinyaga County

Client: British Ministry of Defence (Defence Infrastructure Organization) through Sinclair Knight Merz (SKM)

Main project features: initial environmental Audit of training activities/facilities, baseline noise surveys, ecological and archaeological assessments

Positions held: Local Project Coordinator/Environmentalist

Activities performed: provided input in the environmental audit of training activities and facilities/installations of the British Army, and coordinated the ecological and archaeological assessment of British Army's training areas with inputs of consultants from the National Museums of Kenya

Name of assignment or project: Environmental Impact Assessment of the Proposed Helicopter Infrastructure for the British Army Training Unit in Kenya (BATUK)

Year: 2013

Location: Nanyuki, Laikipia County

Client: British Ministry of Defence (Defence Infrastructure Organization) through Sinclair Knight Merz (SKM)

Main project features: Environmental Impact Assessment, baseline noise surveys, ecological and archaeological assessments

Positions held: Local Project Coordinator/Environmentalist

Activities performed: provided input in the assessment of environmental impacts of the proposed developments and in the baseline noise surveys. Also provided input in the review of the Environmental Impact Assessment Project Report and the Environmental Management Plans for the proposed project.

Name of assignment or project: Pre-feasibility Studies in the Conceptual Master Plan Development for the proposed Albizzia Downs Estate Development Located in Thika

Year: 2013

Location: Thika

Client: Albizzia Downs Estate Limited

Main project features: Environmental and Social Baselines Assessment, advisory in master planning of the development

Positions held: Environmentalist

Activities performed: Provided input in environmental baseline assessment identified potential impacts of the proposed development and participated in development of the master plan for the project

Name of assignment or project: Wet Season Ecological Survey of Mt Longonot National Park

Year: 2013

Location: Mt Longonot National Park

Client: Africa Geothermal International (Kenya) Limited

Main project features: Vegetation, avian and mammalian surveys of species found during the wet season around Mt Longonot National Park

Positions held: Assistant Ecologist

Activities performed: Provided input in ecological assessments that included vegetation mapping, avi-fauna and mammalian surveys of Mt Longonot National Park

Name of assignment or project: Environmental and Social Impact Assessment of Proposed Dual Purpose Vessels (DPVs) Bright Beer Tanks (BBTs) and Empties/fulls warehouse for East African Breweries Limited

Year: 2012

Location: Ruaraka, Nairobi

Client: East African Breweries Limited

Main project features: Environmental and Social Impact Assessment and Development of an Environmental and Social Management Plan

Positions held: Project Manager/Environmentalist

Activities performed: provided input in the assessment of environmental, social and occupational safety and health impacts of the proposed developments, development of mitigation plans for the adverse impacts, and development of Environmental and social Management Plans for the proposed projects.

Name of assignment or project: Initial Environmental Audit of Base Transceiver Stations

Year: 2012 to Date

Location: Country wide

Client: Safaricom Limited

Main project features: Environmental, Energy, and occupational/public health and safety audit

Positions held: Project Manager/Environmentalist

Activities performed: Auditing of the actual impacts of the Base Transceiver Stations on the local air quality, soil and water resources, human health and safety and aesthetics of the surrounding environment. Activities also include measurement of exhaust gas emissions, and noise surveys.

Name of assignment or project: Kenya Power Distribution Masterplan Study

Year: 2012

Location: Country wide

Client: Kenya Power and Lighting Company

Main project features: Baseline Studies of the Power distribution network, and environmental conditions in areas where expansion of the distribution network is planned

Positions held: Environmentalist

Activities performed: Visited 47 Counties for stakeholder consultations to identify key environmental and social impacts for each type of project to be undertaken

Name of assignment or project: Ecological Baseline Survey of Mt Longonot National Park

Year: 2011

Location: Mt Longonot National Park

Client: Africa Geothermal International (Kenya) Limited

Main project features: Ecological Baseline Survey

Positions held: Assistant Ecologist

Activities performed: Provided input in ecological assessments that included vegetation mapping, avi-fauna and mammalian survey of Mt Longonot National Park

Name of assignment or project: Environmental Monitoring of the Mombasa Nairobi 400/220 KV Transmission line and Substations

Year: 2011 to Date

Location: Nairobi to Mombasa

Client: Kenya Electricity Transmission Company (KETRACO)

Main project features: Environmental, Health and Safety Monitoring of Construction works

Positions held: Environmentalist

Activities performed: Carrying out monitoring of the impacts of transmission line construction work on the environment, the health and safety of the surrounding community, and recommendation of mitigation measures to be observed by the Contractor

Name of assignment or project: Environmental and Social Impact Assessment of Benja Investments Limited's Proposed Housing, Infrastructure, Borehole and Boundary Wall Development on a site in Karen, Nairobi

Year: 2011

Location: Nairobi

Client: Benja Investments Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential ecological impacts of the proposed project on Mukoyeti stream and the neighbouring wetland ecosystem, impacts on vegetation in the area, and impacts on energy and water resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Environmental and Social Impact Assessment of Kagitumba/Mirama Hills One Stop Border Post between Rwanda and Uganda

Year: 2011

Location: Rwanda/Uganda

Client: Rwanda Revenue Authority and Ministry of Works and Transport (Uganda)

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential ecological impacts of the proposed project on Muvumba and Kagera Rivers and the neighbouring wetland ecosystem, impacts on vegetation in the area, and impacts on energy and water resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Initial Environmental Audit of Base Transceiver Stations

Year: 2009 to 2011

Location: Country wide

Client: Safaricom Limited

Main project features: Environmental, occupational/public health and safety audit

Positions held: Environmentalist

Activities performed: Carried out an audit of the actual impacts of the Base Transceiver Stations on the local air quality, soil and water resources, human health and safety and aesthetics of the surrounding environment

August 2004 - August 2009 Environment Cost Management (ECM) Centre Limited

Environmentalist

Name of assignment or project: proposed residential development of 18 villas in Karen, Nairobi

Year: 2008

Location: Nairobi

Client: Fair Acres Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of land cover changes from fallow land to residential developments, including impacts on energy, water, and soil resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: proposed effluent treatment plant in Githunguri

Year: 2008

Location: Githunguri, Kiambu District

Client: Fresha Dairy Products Limited (Githunguri Dairy Farmers Cooperative Society)

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of the proposed project on soil and water resources, air quality, and health/safety of the surrounding community

Name of assignment or project: Environmental Audit of Fresha Dairy Products (Githunguri Dairy Farmers Cooperative Society) production plant in Githunguri

Year: 2008

Location: Githunguri

Client: Fresha Dairy Products (Githunguri Dairy Farmers Cooperative Society)

Main project features: Environmental, Health and Safety Audit

Positions held: Environmentalist

Activities performed: Carried out an audit of the impacts of the milk processing plant on energy, water and soil resources, air quality, waste generation and management (organic wastes, effluent with a high BOD and COD, and other inorganic wastes such as plastics and polythene packaging) health and safety concerns

Name of assignment or project: Technical and Financial Audits of road construction and rehabilitation projects awarded to various contractors by the Kenya Roads Board and the Ministry of Roads and Public Works

Year: 2007/2008

Location: Nairobi, Makueni, Muranga, Thika

Client: Kenya Roads Board, Ministry of Roads and Public Works

Main project features: Environmental, Public and Occupational Safety and Health Audit

Positions held: Environmentalist

Activities performed: Carried out an audit of the actual impacts of contractor's activities on the environment i.e. vegetation, air quality, landscape changes from quarrying, soil excavation, and disposal of wastes (soil, used oil and other wastes), impacts of storage of materials on site, health and safety concerns on workers and the community, and review of contractor's environmental safeguards

Name of assignment or project: Development and Implementation of ISO 14001 Environmental Management System

Year: 2007

Location: Nairobi

Client: United Nations Office at Nairobi's (UNON) Division of Conference Services, Publishing Services Section (UNON/DCS/PSS)

Main project features: Development and implementation of an environmental management system

Positions held: Environmentalist

Activities performed: Provided input in the gap analysis, development of the environmental aspects and legal registers, development of an environmental policy, development of procedures for handling environmental concerns, Initial environmental audit, and development of an environmental management plan

Name of assignment or project: proposed development of 4 villas in Karen area, Nairobi

Year: 2007

Location: Nairobi

Client: Ashford Properties Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of land cover changes from fallow land to residential developments, including impacts on energy, water, and soil resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: proposed modern kitchen along Argwings Kodhek Road, Nairobi

Year: 2007

Location: Nairobi

Client: Lecee Denis Diderot French School

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the proposed project's potential impact on energy and water resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: proposed factory along Limuru Road in Kiambu District, and an alternative site in Industrial Area

Year: 2006/2007

Location: Nairobi

Client: Bio Food Products Limited

Main project features: Environmental and Social Impact Assessment of alternative sites

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of land cover changes from fallow/cultivated land to industrial buildings, impacts of effluent and solid wastes generated on water and soil resources, and ambient air quality.

Name of assignment or project: Proposed Cogeneration Project

Year: 2007

Location: Muhoroni

Client: Muhoroni Sugar Company Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of the project on air quality, climate change, waste generation and management, and soil and surface water resources in the area

Name of assignment or project: proposed Tyre Centre along Mombasa Road

Year: 2007

Location: Nairobi

Client: Nyanza Petroleum Dealers Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the proposed project's impact on energy resources, surface water resources, and on waste generation and management

Name of assignment or project: Environmental Audit of quarry and materials sites in Athi River and Kariobangi respectively

Year: 2006

Location: Nairobi and Athi River

Client: National Concrete Company

Main project features: Environmental, Health and Safety Audit

Positions held: Environmentalist

Activities performed: Carried out an audit of the impacts of quarrying on the local environment i.e. impacts on air quality, on energy, surface and ground water and soil resources, impacts of waste generation and management, and health and safety concerns

Name of assignment or project: Environmental Audit of Bio Food Products Limited's production plant along Mombasa Road.

Year: 2006

Location: Nairobi

Client: Bio Food Products Limited

Main project features: Environmental, Health and Safety Audit

Positions held: Environmentalist

Activities performed: Carried out an audit of the impacts of the milk processing plant on energy, water and soil resources, air quality, waste generation and management (organic wastes, effluent with a high BOD and COD, and other inorganic wastes such as plastics and polythene packaging) health and safety concerns

Name of assignment or project: Proposed 400 units for the Ministry of Housing, Sustainable Neighbourhoods Program, Mavoko Municipality

Year: 2006

Location: Mavoko Municipality

Client: Ministry of Housing

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential ecological impacts of the proposed project on the Athi River wildlife dispersal area, impacts on natural resources such as energy, soil, and water, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Proposed Housing Project of 20 units along Mwanzi Road off Lower Kabete, Nairobi

Year: 2006

Location: Nairobi

Client: Avellino Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential ecological impacts of the proposed project on Kibagare stream and the neighbouring wetland ecosystem, impacts on vegetation in the area, and impacts on energy and water resources, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Proposed mixed use development of 50 housing units and 3,880 m^2 of office space along Chiromo Road

Year: 2006

Location: Nairobi

Client: Bonham Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of the project on energy, water and soil resources in the area, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: proposed head Offices and Tyre Centre along Limuru Road

Year: 2006

Location: Nairobi

Client: Nyanza Petroleum Dealers Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential impacts of the proposed development on energy, water and soil resources in the area, and potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Proposed Housing Project of 20 units off Riara Road in Nairobi

Year: 2005

Location: Nairobi

Client: Format Investments Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the potential ecological impacts of the proposed project on the area's vegetation cover and on Kerichwa Kubwa River, potential impacts on energy, water and soil resources, potential impacts of waste generation and management during construction and operation phases

Name of assignment or project: Proposed relocation of a 1500KVA generator, associated switch gear and fuel system in Ruaraka

Year: 2005

Location: Nairobi

Client: Kenya Breweries Limited

Main project features: Environmental and Social Impact Assessment

Positions held: Environmentalist

Activities performed: Carried out an assessment of the proposed project's potential impacts on the local air quality, ambient noise levels, energy resources, and soil and water resources in the area

CURRICULUM VITAE

Proposed Position: **ENVIRONMENTAL LEAD EXPERT**

Name of Firm: Howard Humphreys (East Africa) Limited

Name of staff: **McABON'GO,** Kennedy Kijana

Profession: Environmentalist

Date Birth: 17 July 1980

Years with Firm: 1 **Nationality:** Kenyan

Membership in Professional Societies:

- Registered EIA/EA Lead Expert with the National Environment Management Authority (NEMA) Registration Number 1254

Key Qualifications:

Kennedy is currently pursuing MSc in Environmental Science, Kenyatta University and is a holder of a B.Sc. Degree (Zoology) from the University of Nairobi.

He has over eight years experience in the environmental development field derived from the extensive training and involvement in fieldwork as a Researcher and Environmental Expert for various projects in addition to carrying out Environmental and Social Impact Assessment and Audits.

He has worked on diverse infrastructural projects including telecommunication, power transmission, petroleum, roads, industrial, residential and commercial developments across the country. He has also been involved in carrying out Resettlement Action Plans and Social Impact Assessments for World Bank and African Development Bank funded projects on Roads and Dams such as the Eastern African Electricity Highway 500KV HVDC Project, Gibe III Dam and the Nairobi-Kisumu Highway among others.

Education:

Institution	Date	Degrees
Kenyatta University, Kenya	2013	MSc in Environmental Science (Thesis Level)
University of Nairobi, Kenya	2005	BSc. Degree (Zoology)

Employment Record:

From: May 2013 **To:** Date
Employer: Howard Humphreys (East Africa) Limited
Positions held: Senior Environmentalist

From: 2010 **To:** April 2013
Employer: Panafcon Ltd, Nairobi – Kenya
Positions held: Ecologist/Environmental Specialist

From: 2008 **To:** 2010
Employer: Green Eco Consultants Ltd, Nairobi – Kenya
Positions held: Technical Supervisor/Ecologist/Environmental Specialist

From: 2006 **To:** 2008

Employer:	Panafcon Ltd, Nairobi – Kenya
Positions held:	Ecologist/Environmental Specialist
From:	2005 **To:** 2006
Employer:	University of Nairobi (School of Biological and Physical Sciences-Zoology Department
Positions held:	Research Assistant
From:	2004 **To:** 2005
Employer:	Biodiversity and Biotechnology Unit, Division of Environmental Conventions (UNEP- Nairobi office)
Positions held:	Intern

Experience/ Project Record:

2013 **Kenya – Environment and Social Impact Assessment Study for the Proposed Orthodox Towers on Plot L.R No. 209/1132/1-Along Valley Road, Nairobi.**
(Client: Orthodox Archbishopric of Kenya and Irinoupolis)
Participated in the Project as Lead Environmental Expert
The objective of the Environmental and Social Impact Assessment (ESIA) Study is to identify the effects of the proposed tower building on the environment in order to identify project impacts, appropriate project alternatives and develop cost effective mitigation measures and a monitoring plan. Preparing of an Environmental Impact Assessment Study Report for submission to the National Environmental Management Authority (NEMA) for EIA License.

2013 **Kenya – Environmental Feasibility Study for the Proposed New Wrigley factory in Athi River.**
(Client: Wrigley Global Engineering)
Participated in the Project as Lead Environmental Expert
The objective of the study was to establish the physical and biological environment and its capabilities, and the views of stakeholders in determination of the suitability of the proposed sites for the proposed development. This study took into consideration all legal and legislative requirements such as those in the Environmental Management and Coordination Act 1999 and its subsidiary legislation, the Water Act 2002, and other relevant sectoral regulations.

2013 **Kenya – Social Amenities scoping study for the Kakamega-Webuye road.**
(Client: KeNHA)
Participated in the Project as an Assistant Socio-economist
A Social scoping study for the Kakamega-Webuye road. This project covered six market centres along the project road. The assignment involved documentation review, conducting of Key Informant Interviews, selective observation and inspection of the social amenities, analysis of data collected and production of a social scoping study report for the project road. The intention was to determine the scope for KeNHA's proposed project of providing social amenities along the road.

2013 **Kenya – Initial Environmental, Energy, and occupational/public health and safety audits for Safaricom Base Transceiver Stations.**
(Client: Safaricom Ltd)
Participated in the Project as Lead Environmental Expert
Provided input in the auditing of the actual impacts of the Base Transceiver Stations on the local air quality, soil and water resources, human health and safety and aesthetics of the surrounding environment.

2012 – 2013 **Kenya - Preparation of a Detailed Updated Resettlement Action Plan and Census**

Study for Eastern African Electricity Highway 500KV HVDC Project
(Client: Kenya Electricity Transmission Company Ltd KETRACO)
Participated in the Project as Environmental Expert
The main objectives of this consultancy services carry a detailed RAP.

- The RAP will entail a survey on the amount of land that will be affected by the proposed line, the number of structures that will be affected by the proposed line, the actual number of people that will be affected and the actual number of households that will be affected by the proposed line.
- The consultancy will also carry out estimation of valuation for land to be affected, estimated valuation of structures to be affected, estimated valuation of crops and trees likely to be affected

2012/13: **Kenya - Consultancy Services for the Environmental & Social Impact Assessment for the Proposed Sondu-Homa Bay-Awendo-Migori-Isebania 132 kV Single Circuit Transmission Line**
(Client: Kenya Electricity Transmission Company Ltd KETRACO)
Participated in the Project as Environmental Expert
The main objectives of this consultancy services include but not limited to the following:

- to comply with the Environmental Management and Coordination Act (EMCA) 1999 as stipulated in the Environmental (Impact Assessment and Audit) Regulations 2003 Legal Notice No. 101.
- to verify the adherence and compliance of the World Bank's Safeguard Policies.
- to ensure that the above project is implemented in an environmentally and socially sustainable manner.

2012/13: **Kenya - Consultancy Services for the Environmental & Social Impact Assessment for the Proposed Nyahururu-Maralal 132 kV Single Circuit Transmission Line**
(Client: Kenya Electricity Transmission Company Ltd KETRACO)
Participated in the Project as Environmental Expert
The main objectives of this consultancy services include but not limited to the following:

- to comply with the Environmental Management and Coordination Act (EMCA) 1999 as stipulated in the Environmental (Impact Assessment and Audit) Regulations 2003 Legal Notice No. 101.
- to verify the adherence and compliance of the World Bank's Safeguard Policies.
- to ensure that the above project is implemented in an environmentally and socially sustainable manner.

2012: **Kenya – Environmental Impact Assessment of the Proposed LPG Filling Plant in Kisumu**
(Client: KenolKobil Ltd)
Participated in the Project as an Ecologist
The objective of the Environmental and Social Impact Assessment (ESIA) Study is to identify the effects of the LPG plant on the environment in order to identify project impacts, appropriate project alternatives and develop cost effective mitigation measures and a monitoring plan. Preparing of an Environmental Impact Assessment Study Report for submission to the National Environmental Management Authority (NEMA) for EIA License.

2012: **Kenya – Resettlement Action Plan for the Proposed Upgrading of Rumuruti – Maralal Road to Bitumen Standards**
Client: Kenya National Highways Authority (KeNHA)
Participating in the Project as Environmental Expert/ Data Collection
The main objectives of this consultancy services is to prepare a Resettlement Action Plan for the proposed road upgrading project in accordance with applicable operation procedures of the Government of Kenya and International Development Association (IDA).

2012: **Kenya - Consultancy Services for the Resettlement Action Plan for the Proposed Machakos – Konza – Kajiado – Namanga (155Km) 132kV Transmission Line**
(Client: Kenya Electricity Transmission Company Ltd KETRACO)
The main objectives of this consultancy services carry a detailed RAP.

- The RAP will entail a survey on the amount of land that will be affected by the proposed line, the number of structures that will be affected by the proposed line, the actual number of people that will be affected and the actual number of households that will be affected by the proposed line.
- The consultancy will also carry out estimation of valuation for land to be affected, estimated valuation of structures to be affected, estimated valuation of crops and trees likely to be affected

2012: **Kenya – Resettlement Action Plan for the Proposed Construction of Additional Lanes on JKIA-Likoni-James Gichuru-Rironi Road (A104) and Associated 4 Projects**
(Client: Kenya National Highways Authority (KeNHA))
Participated in the Project as Ecologist
The objective of the project was to identify all potential project affected persons and the impacts of the proposed projects on the livelihoods of affected persons and recommend measures to minimize Resettlement effects and safeguard livelihoods. Carry out a socio-economic survey to generate baseline data for monitoring and evaluation during project implementation period. Carry out an asset inventory survey of all potential assets that will be affected by the proposed projects. Verify compliance with the Relocation and Resettlement Regulations that govern the industry. Provide guidelines to stakeholders participating in the minimizing resettlement impacts of the project. Recommend cost effective measures to be implemented to safeguard the livelihoods. Prepare a Resettlement Action Plan (RAP) report compliant to The World Bank Regulations.

2010: **Kenya - Consultancy Services for the Environmental & Social Impact Assessment and Resettlement Action Plan for the Proposed Voi-Taveta 132 kV Single Circuit Transmission Line**
(Client: KPLC/ World Bank)
The main objectives of this consultancy services include but not limited to the following:

- to comply with the Environmental Management and Coordination Act (EMCA) 1999 as stipulated in the Environmental (Impact Assessment and Audit) Regulations 2003 Legal Notice No. 101.
- to verify the adherence and compliance of the World Bank's Safeguard Policies.
- to ensure that the above project is implemented in an environmentally and socially sustainable manner.
- to prepare a Resettlement Action Plan (RAP) to guide the implementation process.

2010 - 2011: **Kenya and Ethiopia - Consultancy Services for Carrying out Environmental and Social Impact Assessment of Proposed Gibe III Hydroelectric Power Project: Downstream of Gibe III: Kenyan Perspective**
(Client: Kenya Electricity Transmission Company Ltd (KETRACO)
The Gibe III hydroelectric power project is being implemented by the Ethiopian Electric Power Corporation (EEPCO). It is located within the Gibe – Omo River Basin 675 km trajectory from its terminus at Lake Turkana, Kenya – Ethiopia border.
The objective of the project is to evaluate the effect of the Gibe III Hydroelectric Power Dam on the 675km downstream along River Omo and the Lake Turkana environment where the river feeds into. The potential effects downstream include hydrological (particularly on the River Omo and Lake Turkana), socio-economic for the inhabitants, ecological for plants & animals, archeological & cultural areas including the wetlands.

2011: **Kenya - The Project on the Development of National Water Master Plan 2030 – Water Use and Groundwater Survey**
(Client: Nippon Koei Co., Ltd. Water Resources Management Authority (WRMA))
The project involved assessing and evaluating availability, reliability, quality, and vulnerability of the Country's water resources up to around 2050 taking into consideration of climate change, reviewing the National Water Master Plan towards the year 2030 taking into consideration of climate change and formulating action plan up to the year 2022, strengthening capacity of water resources management.

2012: **Kenya - Environmental Risk Assessment**
(Client: Kenya Shell Limited)
Conducted Environmental Risk Assessment (ERA) at a Shell Terminal – Nairobi and will prepare an Environmental Risk Assessment (ERA) Report for submission to the client. The ERA is being carried out after there was an accidental release of substantial amount of product to the ground due to a pipe failure The risk assessment is being carried out to determine the extent of soil contamination and whether groundwater has been impacted or there is potential that it will be impacted by the released product.
It involves site inspection for potential contaminant source areas, identification of geo-probe locations for soil vapour survey using a 2020 Pro Plus Photo Ionization Detector (PID)
Soil and Groundwater samples have been collected for laboratory analysis.

2011 - Kenya - Electrical Post Investment Review at selected Six (6) High and Medium Risk Sites in Nairobi, Ongata Rongai, Machakos and Naivasha
(Client: Kenya Shell Limited)
The purpose of the review was to evaluate and provide further assurance that the electrical remedial works carried out in High and Medium Risk sites in 2010 & 2011 are in full compliance with Existing Consultant's investigation report and upgrade recommendations, Shell Electrical Standards and Local Relevant Standards / British Standards / IEC Standards and ALL other applicable codes and regulations in the country of Audit i.e. Kenya.

2011: **Name of assignment or project: Design of Groundwater Remediation Well**
Location: Mombasa
Client: Kenya Shell Limited
Main project features: The main objectives of this consultancy services is to supervise and monitor groundwater remediation at Shell South Coast Service Station – Groundwater level monitoring, sample collection for laboratory analysis and reporting
Position held: Field Officer
Activities performed: Conducted supervision and monitoring of groundwater remediation at Shell South Coast Service Station – Groundwater level monitoring, sample collection for laboratory analysis and reporting

2009: **Name of assignment or project: Time and Motion Survey for the Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya**
Location: Nairobi, Kenya
Client: JICA/City Council of Nairobi
Main project features: Time & Motion survey.
Position held: Environmentalist/Field surveyor
Activities performed: The Study involved conducting Time & Motion survey for the eight (8) waste collection vehicles of CCN, the sub-contracted contractor's vehicles and the private collection vehicles over a period of one month subordinately for comparison of the vehicle operation efficiency in solid waste management.

2009: **Name of assignment or project: Environmental Impact Assessment for Ndakaini Environmental Management and Poverty Reduction Project**
Location: Thika and Maragua Districts, Kenya

Client: NDEKA (Ndaka-ini Environmental Conservation Association)
Main project features: Ndaka-ini environmental conservation and poverty reduction project was conceptualized by the local communities in Gatanga and Kigumo districts in Thika and Maragua districts. The project was proposed by NDEKA, a community based organization representing 30 CBOs in the dam catchment area bounded by Ndaka-ini and Makomboki sub-locations).
Position held: Environmentalist/Deputy team leader
Activities performed: The study identified impacts and formulated cost effective mitigation measures and a monitoring plan and the preparation of the Environmental Impact Assessment (EIA) Report for submission to NEMA for EIA Licensing.

2007: **Name of assignment or project: Environmental and Occupational Health & Safety Audits for 135 Sites**
Location: Various cities and towns in Kenya
Client: Kenya Shell Limited
Main project features: The study entailed soil and groundwater investigations to determine environmental risk associated with the fuel storage and dispensing facilities to provide environmental assessment data in relation to the previous audit.
The report presents the results of the self audit in comparison with the previous Initial Audit carried out in 2004 including the current environmental status of the site in accordance with the Environmental Management and Coordination Act (EMCA) 1999, Environmental (Impact Assessment and Audit) Regulations of 2003 and the EIA and Audit Guidelines.
Position held: Environmentalist
Activities performed:. The self EA evaluated how effectively the sites are implementing the proposed EMP and the resulting environmental status taking into consideration any new environmental mitigation measures introduced into the site to ensure continued safeguarding of the environment.

CURRICULUM VITAE

Proposed Position:	**ENVIRONMENTAL LEAD EXPERT**
Name of Firm:	Howard Humphreys (East Africa) Limited
Name of Staff:	**NJUE** Lawrence Kariuki
Profession:	Environmental and BioSystems Engineering
Date of Birth:	1978
Years with the Firm:	5 **Nationality:** Kenyan

Membership in Professional Societies:

Registered Lead Expert in Environmental Impact Assessment/ Environmental Audit with the National Environment Management Authority (NEMA), Kenya (NEMA Reg. No. 0781).

Key Qualifications:

Lawrence Njue has 9 years of experience in Environmental Impact Assessment/Audits in Kenya. Njue is registered by NEMA, Kenya's Environmental Management Agency as a Lead Expert in Environmental Impact Assessment/Audit. Njue has also has undertaken a short course on Quality Management System and basic fire situation management skills.

Lawrence has vast experience in carrying out Environmental and Social Impact Assessment in various industries among them; water supply, community projects, building construction, health care, energy, industrial and manufacturing. He is well conversant with local and international regulations, guidelines and standards which govern environmental studies.

Lawrence has experience in safety and health management, having been involved in safety and health supervision and monitoring for projects during construction phase. He is well conversant with local legal provisions including the Building Operations and Works of Engineering Construction Rules, 1984, Occupational Safety and Health Act (OSHA), 2007 and its subsidiary rules among others.

He is proficient in computing packages including Ms Windows, Ms Word, Ms Excel, Ms Power Point, Ms Access, SPSS, AutoCad and ArcView among others.

Education:

Institution	Date	Degree (s)
Jomo Kenyatta University of Agriculture and Technology	On-going	MSc. Occupational Safety and Health
University of Nairobi	2004	BSc. in Environmental and Biosystems Engineering
Kenya Institute of Management	2008	Diploma in Project Management

Other short courses undertaken include;

- December 2010 - Quality Management Systems - Awareness Training: The objective was to provide an overview of the purpose and requirements of ISO 9001:2008 as a tool for business improvement (purpose & intent of ISO 9000 series; requirements of ISO 9000:2008; and relationship between the clauses of ISO 9000:2008) by SGS Kenya Limited

- May 2011- Fire Marshal: the objective was to equip the trainees with basic fire situation management skills; specifically fighting medium fires and safe evacuation by G4S Group

Employment Record:

2009 to date: Howard Humphreys (East Africa) Limited
Senior Environmentalist

2008 to 2008: Mazingira Consultants
Associate Consultant

2006 to 2007: Log Associates
Technical Manager

2005 – 2006: Log Associates
Management Trainee

Professional Experience:

Relevant projects undertaken and demonstrate capability for this assignment are summarized below.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT:

2014 **Unilever Kenya Limited:** Environmental and Social Impact Assessment (ESIA) for the expansion works at the Nairobi premises, involving extension of the Non-Soap Detergent Factory, Lift Shaft Extension and associated works and the steel floor at Royco plant. ESIA project tasks include; desktop studies; site visits and stakeholders' consultations through interviews and workshops; prediction and characterization of potential environmental impacts using professional judgments; development of environmental management plans including ESIA Report.

2012/13 **Western Kenya Community-Driven Development and Flood Mitigation Project:** Environmental and Social Impact Assessment (ESIA) for the Assessment of Levee Integrity and Floodplain Condition and Final Design of New Flood Protection Works in the Downstream Region of the Nzoia River. ESIA project tasks include; desktop studies; site visits and stakeholders' consultations through interviews and workshops; prediction and characterization of potential environmental impacts using professional judgments; and development of environmental management plans. Presentation of findings in Technical and community workshops.

2013 **East African Breweries Limited**: Environmental Impact Assessment for the EABL Access Road Rehabilitation and Improvement of Access Road to Ngumba Estate. This is an ongoing project being finalized and key activities included; site assessment, stakeholder's identification and consultation and report compilation including review of current relevant policy, legal and regulatory framework.

2012 **East African Breweries Limited**: Environmental Impact Assessment for the New Spirits Packaging Line II at EABL Factory in Ruaraka-Nairobi. Main activities

undertaken included; site inspection and assessment, stakeholder's consultation and report compilation.

2012 **Kenya Power:** Carried out an Environmental and Social Impact Assessment Scoping Study as part of the Distribution Master Plan. Activities undertaken included;

- Undertook desk based study and review of key environmental data and prepared a high level baseline for each of the 47 counties for the key environmental and social aspects. Identified key environmental and social constraints;
- Identified Statutory Consultees and undertook consultations at their central offices to highlight any significant issues and potential impacts / opportunities and to identify requirements for further consultation in the counties;
- Visited 47 Counties for Stakeholder Consultation to identify key environmental and social impacts for each type of project undertaken;
- Prepared outline of likely mitigation / enhancement measures and monitoring requirements to be considered in detail at the ESIA stage and provided an initial indication of costings; and
- Attended stakeholder workshops as required.

2010 **Tana Water Services Board**: Environmental Impact Assessment of Murang'a North and Murang'a South Bulk Water Supply: Scope of services involved carrying out the Environmental Impact Assessment Study of the Project and the preparation of the Environmental and Social Impact Assessment Project Report. Input on preparation and review of the Environmental and Social Impact Assessment Project Report.

2006 **The Kenya Power and Lighting Company Limited (Now Kenya Power):** Environmental and Social Impact Assessment for the construction of the Chemosit–Kisii and Kamburu–Meru 132kV Transmission Lines and associated Substations Project.

2005 **The Kenya Power and Lighting Company Limited (Now Kenya Power):** Environmental Impact Assessment Study for Loss Reduction Projects for distribution substations and their associated lines in Nairobi, Kisumu, Sibembe and Nyeri areas.

2005 **Kenya Breweries Limited. Environmental Impact Assessment:** Installation of four fermentation tanks at their plant in Ruaraka, Nairobi. The assignment involved design of appropriate mitigation management and monitoring measures.

2005 **Kenya Breweries Limited. Environmental Impact Assessment:** Modification and conversion of an existing store to house a new keg Line.

2009 **Cooperative Bank of Kenya:** Environmental Impact Assessment Study. Construction of a modern banking hall on Plot No. 57 in Siakago Town.

2009 **Booths Extrusion Limited:** Environmental Impact Assessment Study. Expansion of the surface finishing process line in Thika.

2009 **Kilele Investments Limited:** Environmental Impact Assessment Study for residential maisonettes on L.R. No. Ngong TOWNSHIP/BLOCK2/578.

2009 **Ms Joseph Nakodony Nkadayo:** Environmental Impact Assessment Study . Residential development (Apartments) on L.R. No. NAIROBI/BLOCK 93/1450.

2009 **Ms Harji L. Patel and Manji H. Patel:** Environmental Impact Assessment Study for residential (flats) on LR. No 209/1910, in Ngara Nairobi.

2008 **Sheco General Contractors Co. Ltd:** Environmental Impact Assessment for a commercial development (Hotel) on LR. No 347/348 along Narok-Bomet-Kisii Road, Narok District.

2008 **Ms Joshua Ololchurie:** Environmental Impact Assessment Study for a commercial high rise building on LR. No 65 Block 4, Narok Town.

2008 **Ms Lee Muchiri Waititu:** Environmental Impact Assessment Study for residential Apartments on LR. No 209/11117, South C, Nairobi.

2008 **Ms Peter Kungu:** Environmental Impact Assessment Study for residential flats on LR. No 209/12823, Balozi Estate-South C, Nairobi.

2007 **The Kenya Power and Lighting Company Limited (Now Kenya Power:** Environmental and Social Impact Assessment for the construction of the proposed Rabai–Diani 132kV and Arusha–Embakasi 330kV Transmission Lines and associated Substations projects for Kenya Power.

2007 **Mumias Sugar Company Limited:** Environmental and Social Impact Assessment for the construction of the Mumias–Musaga 132kV line.

RESETTLEMENT ACTION PLANS

2011 **Kenya National Highways Authority:** Preparation of Resettlement Action Plans for Second Carriageway from Athi River to Ulu Road (A109). Activities and tasks under this project includes; identification of project impacts and affected populations; review of the legal framework for land acquisition and compensation; development of a compensation framework; development of a strategy for resettlement assistance and restoration of livelihoods; development of a detailed budget and implementation schedule; formulation and description of organizational responsibilities; development of a framework for public consultation, participation, and development planning; development of provisions for redress of grievances; and development of a framework for monitoring, evaluation, and reporting.

ENVIRONMENTAL AUDITS:

2014 **Safaricom Limited:** Statutory Environment, Occupational Safety and Fire Safety Audit for Safaricom Facilities. Carried out site visits for twenty nine facilities (head quarter, retail shops and mini switches) in Nairobi, Western, Nyanza and Eastern regions. Main activities included; review of relevant environmental legislative documents, detailed inspection of site facilities and operations, public consultation and participation, assessment of environmental compliance levels, measurement parameters including; Electromagnetic Energy, Noise levels, Flue gas emissions and indoor air quality; and report writing. Lawrence had input on preparation of data collection tools, safe logging in and out of mini switches, site assessment (facilities and neighbourhood settings), noise and flue gas emission measurements and report writing.

2013 **Safaricom Limited:** Initial Environmental Audit for Safaricom Base Transceiver Stations. Carried out site visits for fifty sites in Nairobi, Nyanza and Rift Valley regions. Main activities included; review of relevant environmental legislative documents, detailed inspection of site facilities and operations, public consultation and participation, assessment of environmental compliance levels, measurement of BTS parameters including; Electromagnetic Energy, Noise levels and Flue gas emissions and report writing. Lawrence had input on preparation of data collection tools, safe logging in and out of BTS, site assessment (facilities and neighbourhood settings), stakeholders consultation, report writing and compilation, and presentation of findings to client.

2012 **Safaricom Limited:** Initial Environmental Audit for Safaricom Base Transceiver Stations. Participated in audits of forty sites in Central and Eastern Kenya. Main activities included; review of relevant environmental legislative documents, detailed inspection of site facilities and operations, public consultation and participation, assessment of environmental compliance levels, measurement of BTS parameters including; Electromagnetic Energy, Noise levels and Flue gas emissions and report writing. Lawrence had input on preparation of data collection tools, safe logging in and out of BTS, site assessment (facilities and neighbourhood settings), stakeholders consultation, report writing and compilation, and presentation of findings to client.

2010 **Safaricom Limited:** Initial Environmental Audits of Safaricom Facilities and Retail Centres. Main activities included; review of relevant environmental legislative documents, detailed inspection of site facilities and operations, public consultation and participation, assessment of environmental compliance levels and report writing. Input on detailed facility assessment (fire detection and suppression systems, waste generation and management, lighting, water sources and usage, energy sources and consumption) neighbourhood setting, stakeholders consultation including staff, report writing and compilation. These were undertaken for the Safaricom Care Centre (SCC) in Westlands, Meru Retail Centre and Nanyuki Retail Centre.

2009-2010 **Safaricom Limited:** Initial Environmental Audit for Safaricom Base Transceiver Stations. Audited 568 BTS in Nairobi, Coast, Western, Rift Valley/Nyanza and Central regions of Kenya. Main activities included; review of relevant environmental legislative documents, detailed inspection of site facilities and operations, public consultation and participation, assessment of environmental compliance levels, measurement of BTS parameters including; Electromagnetic Energy, Noise levels and Flue gas emissions and report writing. Lawrence had input on preparation of data collection tools, safe logging in and out of BTS, site assessment (facilities and neighbourhood settings), stakeholders consultation, report writing and compilation, and presentation of findings to client.

2012 **Lake Victoria North Water Services Board:** Environmental Audit for the Lessos Water Supply Project. Tasks undertaken included site assessment, EHS documentation, compliance with legal requirements including WARMA, NEMA and DOSHS, stakeholder's consultation, report writing and compilation.

2009 **Langata Hospital:** Environmental Audit. Study to assess the hospitals corporate environmental policy, waste management system, energy and water use, emergency contingency measures for accidents, occupational health and safety practice, environmental disasters and personal injury, incident reporting procedures and social responsibility among others.

2008 **Norflora (K) Limited:** Annual Environmental Audit. Appraisal of the flower farm activities, equipment's and chemicals used, workers and public consultations and report writing and submission to NEMA.

2008 **Ms Jatin A. Shar: Initial Environmental Audit.** Audit for a ware house on LR. No 209/7335 in Industrial Area Nairobi. Activities included review of ware house activities for environmental compliance and development of an environmental management and monitoring plan as a baseline for subsequent annual environmental audits.

2007 **Kenya Industrial and Research Institute (KIRDI).** Initial Environmental Audit Study for all KIRDI facilities. Tasks included; assessing compliance to regulatory provisions, facility/process inspection, identifying improvement opportunities, developing an Environmental Management Plan, report writing and submission to NEMA.

2006 **Pyrethrum Board of Kenya. Annual Environmental Audit:** Project undertaken to verify compliance with environmental rules and regulation in undertaking daily operations at the

factory by PBK. Tasks undertaken included physical inspection and interactive sessions with the management and employees in checking compliance and work place health and safety. Air emission and effluent samples from the factory were collected and tested at NEMA accredited laboratories. The EMP was revised based on the assessment findings. The exercise was conducted out as per NEMA regulation as stipulated in the Environmental Management & Coordination Act (EMCA).

2005 **Pyrethrum Board of Kenya. Environmental Audit: Environmental Audit:** Appraisal of all activities undertaken by Pyrethrum Board of Kenya giving special attention to environmental regulatory framework, environmental health and safety measures. Effects of dust, flue gases were assessed including tests of air emission samples from the boilers.

2005 **The Kenya Power and Lighting Company Limited (Now Kenya Power):** Environmental Audit of all KPLC facilities. Tasks included inspection of offices, workshops, distribution power lines and substations, report compilation and submission to NEMA.

SAFETY AND HEALTH AUDITS, AND MONITORING:

2013 **Aga Khan University Hospital:** Statutory Occupational Safety and Health Audit for facilities situated along 3rd Parklands Avenue in Parklands, Nairobi City. The scope included; evaluating conformity of activities/operations with the requirements of the Occupational Safety and Health Act, 2007 and other subsidiary legislations, give recommendations for continual improvement of the health and safety management system and submit statutory audit report to the Directorate of Occupational Safety and Health Services. Lawrence had support input to the Lead Safety Advisor in site assessment and report compilation.

2013 **Unga Farm Care (EA) Limited:** Statutory Occupational and Safety Audits. Tasks were to; Evaluate conformity of operations with the requirements of the Occupational Safety and Health Act, 2007 and other subsidiary legislations, give recommendations for continual improvement of the health and safety management system and submit statutory audit report to the Directorate of Occupational Safety and Health Services. The audit scope covered; Mineral Plant in Nakuru, factories and associated infra-structure in Nairobi and Nakuru and Eldoret facilities along 64 street. Lawrence had support input to the Lead Safety Advisor in site assessment and report compilation.

2012/13 **Safaricom Limited:** Occupational Safety and Health, and Environment Supervision for the Safaricom Digital City Project. Ensuring OSH regulatory and clients requirements are observed by the contractor during construction. Project activities include laying of fibre optic cable by two international contractors.

2012/13 **Safaricom Limited:** Occupational Safety and Health Audit for Safaricom Base Transceiver Stations. Lawrence had support input to the Lead Safety Advisor in site assessment, report compilation and presentation of findings to the client.

2012 **Kenya Electricity Transmission Co. Ltd (KETRACO)**: Construction of the Mombasa – Nairobi 400kV Transmission Lime. Detailed Environment, Safety and Health (EHS) audit of the construction activities. Tasks included an assessment of the contractor's compliance to the regulatory provisions i.e. EMCA, 1999 and OSHA, 2007, and the Environmental Management Plan (EMP) and Environment, Safety and Health (EHS) Plan. This was achieved through site inspections, interview with workers, contractor's representatives and Project Affected Persons (PAP's) on the implementation of the Resettlement Action Plan.

2012 **Tana Water Services Board**: Supervision works for the Construction of Kandara Water Supply Scheme and Muranga Urban Water Scheme - Environmental, Safety and Health (EHS) Inspection /Monitoring. Specific tasks include; ensuring contractor's compliance to the Occupational Safety and Health Act (OSHA), 2007, Contract Specifications, the Building Operations and Works of Engineering Construction Rules, 1984 and the EHS plan requirements, and writing monthly environmental, safety and health monitoring reports.

2012 **Athi Water Services Board**: Environmental Safety and Health (EHS) Monitoring for the Rehabilitation of Ngethu-Gigiri Transmission Mains. Scope of services involves ensuring adherence/ compliance to the relevant legal and regulatory provisions, contract specifications on EHS and the project EHS plan. Inspections and reporting are on monthly basis.

2010 **Lake Victoria North Water Services Board:** Supervision Works in Packages 4 (Lessos, Cluster 1 Rural Growth of Lumakanda and Kipkarren and Cluster 2 RGC of Chesikaki, Sirisia and Cheptais. Monitoring, controlling and reporting on implementation of the Environmental Management Plan (EMP) and Health and Safety aspects by site contractors for construction phase. Lessos Water Supply Augmentation Works and New Water Supply System for Lumakanda and Kipkarren. Input on development of implementation plan for the EMP, progress site visits and meetings and reporting on the same.

2010 **Central Bank of Kenya**: Safety Audit and Installation of Fire Detection and Suppression at Central Bank of Kenya Headquarters and Branches. Project included undertaking Statutory Occupational Safety and Health Audit, and Fire Audit for facilities in Nairobi, Kisumu, Eldoret and Mombasa. Tasks included; review of internal safety and health management arrangements, physical examination/inspection of workplace environment, assess fire risks associated with operations, and advising the occupier on compliance with the Occupational Safety and Health Act, 2007 (fire risk reduction) Rules 2007. Training was a key component of the assignment. Njue had support role to the Safety Advisor and Fire Auditor.

SOCIAL AND FEASIBILITY STUDIES:

2007 **Ministry of Agriculture:** Comprehensive GPS Mapping of Project Activities and Beneficiaries Impact Assessment- Eastern Province Horticulture and Tradition Food Crops Project (EPHTFCP). GPS mapping of the project activities and beneficiary impact assessment of all project components and subcomponents.

2007 **CARE International in Kenya:** Mid-Term Review of LIME Projects. Project funded by CARE Australia.

2007 **Ministry of Environment and Natural Resources:** Lake Victoria Environmental Management Project II. Preparation of Programme Operational Manual and Handbook.

2007 **Ministry of Regional Development Authorities:** Formulation of a Strategy Paper on Sustainability of Regional Development Authorities. Development of sustainability strategies for the regional Development Authorities in line with the core functions as enshrined in their Acts of Parliament and the proposals contained in the draft Regional Development Policy.

2007 **Ministry of Water and Irrigation:** Smallholder Irrigation Programme in Mount Kenya Region (SIPMK). Detailed Design and Construction Supervision Services for Kithumbu Irrigation Scheme (Kirinyaga District), and Mbwiru Mwanjati Irrigation Scheme (Meru South District). The project also involved undertaking an Environmental Impact Assessment for the two schemes.

2006 **Ministry of Planning & National Development, Southern Nyanza Community Development Project;** Baseline Survey in Nyamira, Rachuonyo, Homabay, Migori, Kuria and Suba Districts.

2005/06 **Mumias Sugar Company:** Sugar Cane Transport and Cane Yard Operations Study: Project whose main objective was to identify, study the operations of Mumias Sugar Company and Cane Handling Operations, identifying the bottlenecks and proposing an improved handling system for handling the sugar cane from the fields to the feed tables.

2005 **Kenya Tea Development Authority (KTDA). Feasibility Studies for Mini-Hydroelectric Power Project for KTDA Factories:** Detailed Feasibility Studies for the mini hydroelectric projects for KTDA factories in Central Province.

2005 **Plan International in Kenya:** Mid Term Evaluation for the Right to Water and Environmental Sanitation Projects in Coast Province.

2005 **Office of the President-Ministry of Special Programmes. Arid Lands Resource Management Project II:** Analysis and Interpretation of Baseline Results Conducted by the Central Bureau of Statistics for the Arid Lands Resource Management Project II.

CURRICULUM VITAE

Proposed Position: **SUPPORT STAFF**

Name of Firm: Howard Humphreys (East Africa) Ltd

Name of staff: **NJERU**, Lydia Wamugo

Profession: Sociologist

Date Birth: 1987

Years with Firm: 1 **Nationality:** Kenyan

Membership in Professional Societies: None

Key Qualifications:

4 years of experience in Social science-related Services and delivery of project reports. Responsibilities include:

- Research Instrument design, data collection and analysis
- Conducting baseline socio-economic studies for ESIAs
- Preparation of Social Impact Assessment reports and Social Management Plans(SMPs)
- Organization and facilitation of public hearings as a way of stakeholder engagement
- Resettlement Action Planning services for Infrastructure projects
- Supervision of construction works with focus on Social Welfare, Environment, Health & Safety
- Preparation of Public Consultation Reports for EHS Audits

Education:

Institution	Date	Degrees
University of Nairobi, Kenya	On-going	M.A Rural Sociology & Community Development
University of Nairobi, Kenya	2009	B.A Sociology
TENRI Computer College	2006	Diploma in Information Technology

Employment Record:

April 2013 to date **Howard Humphreys E.A Limited**

Sociologist

- Environmental, Fire, Health and Safety Audit for Safaricom Facilities in the Nairobi, Western, Eastern and North Eastern Kenya regions. This project covered 28 Safaricom retail centres and mini switches in the regions. I visited all the facilities and sought employees' and neighbours' opinions on the specific Safaricom shop/mini switch. The assignment involved design of a data collection instrument (questionnaire), photography, observation, conducting of key informant interviews, questionnaires administration and analysis and production of a public consultations report for each of the facilities. This assignment was done in the first two weeks of March, 2014.

- Environmental Feasibility Study for the Proposed New Wrigley factory in Athi River, Machakos County. This assignment majored on public consultations that involved detailed description of the socio-economic and cultural environment of the project area including (population, land use, water supply, sanitation levels among others pertinent issues). Identification and description of pertinent regulations and standards, identification, analysis

and engagement of project stakeholders, determination of the social impacts of the proposed project and mitigation measures for the negative impacts was also done.

- Environmental & Social Impact Assessment for the Proposed Orthodox Towers along Valley road, Nairobi. The assignment involved detailed description of the the socio-economic and cultural environment of the project area including (population, land use, land tenure, the dimensions of social well-being and income levels, water supply, sanitation levels, migratory trends among others pertinent issues). Identification and description of pertinent regulations and standards, identification, analysis and engagement of project stakeholders, determination of the social impacts of the proposed project and mitigation measures for the negative impacts, development of a social management and monitoring plan and compilation of a Social Impact Assessment report that was used to inform the Environmental & Social Impact Assessment (ESIA) report.

- Environmental Prefeasibility Study for the Proposed Albizzia Downs Estate Limited in Thika, Kiambu County. This assignment majored on public consultations that involved detailed description of the socio-economic and cultural environment of the project area including (population, land use, water supply, sanitation levels, security concerns among others pertinent issues). Identification and description of pertinent regulations and standards, identification, analysis and engagement of project stakeholders, determination of the most preferred development option as well as determination of the social impacts and mitigation measures for the negative impacts was also done.

- A Social scoping study for the Kakamega-Webuye road. This project covered six market centres along the project road. The assignment involved documentation review, conducting of Key Informant Interviews, selective observation and inspection of the social amenities, analysis of data collected and production of a social scoping study report for the project road. The intention was to determine the scope for KeNHA's proposed project of providing social amenities along the road. This was done in August 2013.

- Environmental, Health and Safety Audit for Safaricom Base Transceiver Stations in the Rift valley and greater Western Kenya regions. This project covered 40 Base Transceiver Stations in the regions. I visited all the stations and sought affected and interested stakeholders' opinions on the specific BTS'. The assignment involved design of a data collection instrument (questionnaire), photography, observation, conducting of key informant interviews, analysis of data collected and production of an EHS audit report for each of the stations. This assignment was done in July 2013.

- Environmental, Health and Safety Audit for Safaricom Base Transceiver Stations in Nairobi County. This project covered 10 Base Transceiver Stations in Nairobi area. I visited all the stations and sought affected and interested stakeholders' opinions on the specific BTS'. The assignment involved design of a data collection instrument (questionnaire), photography, observation, conducting of key informant interviews, analysis of data collected and production of an EHS audit report for each of the stations. This was done in June 2013.

- Preparation of an Inception report for the Resettlement Action Plan (RAP) for the proposed Kitui-turn-off-Mwingi-Garissa road.

- Preparation of a summary social-survey report for the Water supply and Access roads for the Longonot Geothermal power project.

June 2012 to February 2013 Charles and Barker Limited, Nairobi.

Team Leader; Sociology
Team's Sociologist managing the fieldwork team and coordinating fieldwork activities.

Projects involved in:

- Preparation of an Inception report for the Resettlement Action Plan (RAP) for the proposed Nakuru-Loruk-Marich Pass Road.

- Social and Environmental Monitoring works of the construction of the Kiu-Dandora Trunk Mains Sewerage Improvement and Expansion Project. This project covered 11 sewer treatment ponds in Dandora area. I visited the site weekly, prepared weekly, monthly and quarterly environmental & Social Monitoring reports for Sino-Hydro Kenya Ltd. The assignment involved preparation of a data collection instrument (a monitoring questionnaire), photography, observation and conducting of key informant interviews.

- The Kitui turnoff-Mwingi-Garissa road ESIA. This project covered Environmental and Social Impact Assessment; participated in the research instrument design, reviewed relevant documentation, conducted the field socio-economic study, facilitated the public consultations and was part of the team that compiled the ESIA report, including the Environmental and Social Management Plan (ESMP).

- Preparation of the Inception report for the Kitui Turn off Mwingi Garissa road Resettlement Action Plan, Design of the research instrument for this RAP(A household/business owners consultation form), and conducted questionnaire interviews for the first one week..

- Annual 2011/2012 Environmental Audit Study for Base Titanium LTD; the Kwale Mineral Sands Project. Covered relevant Legislations, Resettlement activities, Stakeholder engagement, the Grievance redress system and Community social responsibility as relates to the project's Main plant, Tailings Dam, Mukurumudzi Dam, Water Supply, 9km access road off the Likoni Lunga Lunga Road and the Ship Loading Facility at Likoni.

- Ilenye River Basin Management Plan, Mwingi. Involved a socio-economic study to help development alternative sources of livelihoods for the residents of the area who over rely on rain-fed agriculture.

- The Proposed Edible Oil and Fraction Packing & Soap plant project by Golden Africa Kenya LTD covering Environmental and Social Impact Assessment. I was part of the team that conducted the public consultations using questionnaires.

2009: Kabete Vet Labs, Nairobi
Research Assistant

Responsibilities:
- Receiving questionnaires form the field interviewers and sorting them
- Accurately entering the questionnaire responses in the computer database
- Data analysis using basic spread sheet software.

2008: IPSOS Synovate Kenya, Nairobi
Field Interviewer/Data Coding Officer

Responsibilities:
- Participated in team research projects as a field interviewer

- Maintained neat, sorted and coded questionnaires to ensure data reliability at all times
- Prepared code lists when necessary
- Coded questionnaire responses

12.4 Hydrogeological Study Report

Howard Humphreys (East Africa) Limited
Consulting Engineers

Red Coral Properties Ltd

Red Coral Development in Limuru

Hydrogeological Survey Report

10423K-GTR-C-0004

August 2013

Rev. 0

Consultant:
Howard Humphreys (EA) Ltd
Howard Humphreys House
Muthangari Drive, Off
Waiyaki Way, Westlands
P. O. Box 30156 - 00100,
NAIROBI.

Submitted to:

Athi Catchment Area, Nairobi Sub-Region,
P.O. Box 18150-00500
NAIROBI

REVISION RECORD SHEET

This page is a record of all revisions, if any, made to the attached document. The revisions are listed under "Revisions/Changes". The revisions are part of the document and override the corresponding parts of the Original Document.

Revisions/Changes:

None

Remarks: Issued to WRMA for approval

Client:	Red Coral Properties Ltd						
Project:	**Red Coral Development in Limuru**						
Document Title	Hydrogeological Survey Report August 2013						
Doc. No.	10423K-GTR-C-0004	**Rev:**	No 0	**Date:**	**Orig.**	**Check.**	**Appr.**
Attachments	Entire Document		√	5 August 2013	DOO	OBO	JMM
	Revised Pages Only						

Note: *This page and all its contents are NOT part of the document.*

HYDROGEOLOGICAL SURVEY REPORT

FOR

RED CORAL ESTATE LTD
P. O. BOX 39542-00623
NAIROBI

L.R. No LIMURU/RIRONI/11532

Hydrogeologist: D O Odero
No. WP/WRP/001/35

Signed: ……

CONTENTS

PROJECT SUMMARY

APPLICANT	RED CORAL ESTATE LTD P. O. BOX 39542-00623, NAIROBI Contact Person: RANEE NANJI Tel: +254738832163
DESCRIPTION	The applicant is a mixed use development planned for a 294 acre property at Rironi. The development is set to be one of a kind in the East African region hence a landmark development statement and trendsetter. The developer is keen on ensuring sufficient water supplies are available on site both during construction and for subsequent operational use. The area falls within the Limuru Water and Sewerage Company supply area, but the water service provider does not have adequate water resource development to meet the supply area demand. It is against this backdrop that Red Coral Estate is keen on meeting its supply needs from own sources as much as possible, until such a time that the mains supply will provide a reliable alternative.
CURRENT WATER SOURCE	The Applicant has two borehole sources, No. C-3449 and C-4693. The status of the permits is not clear and the Applicant has been advised to ensure the boreholes are rehabilitated and their status updated.
AMOUNT APPLIED FOR	The Applicant desires to harness as much ground water as possible from a number of boreholes to meet projected demand. It is estimated at the moment that the demand will be in excess of 1,000m^3/day.

PROPOSED BOREHOLES

At least 8 boreholes are proposed, as tabulated overleaf. The proposed drilling depths and locations are shown. All sites are known to Mr John Ekiring a staffer in the estate. The distances between the boreholes vary between 110m and 825m, which is sufficient to avoid interference between pumping boreholes.

It is expected that the borehole yields shall range between 8 – 15 m^3/ hr, of excellent quality water.

Site ID	UTM Easting (WGS 84)	Northing	UTM Easting (Arc 1960)	Northing	Recommended depth (m)	Anticipated yield (m3/hr)
Site 1	238179	9874230	238085	9874530	280	8
Site 2	237951	9874352	237857	9874652	250	15
Site 3	237937	9874456	237843	9874756	250	15
Site 4	238258	9873990	238164	9874290	280	8
Site 5	238545	9873423	238451	9873723	300	12
Site 6	238804	9872959	238710	9873259	250	12
Site 7	238424	9872225	238330	9872525	300	8
Site 8	238496	9873635	238402	9873935	300	8
					TOTAL	**86**

1 PHYSICAL DESCRIPTION

1.1 Location and climate

Red Coral Estate is located in Rironi area which is in the higher altitude zone exceeding 2000 metres above mean seal level. The site is located between longitudes 36° 38' 15" E and 36° 39' 15" E and latitudes 1° 07' 50" S and 1° 09' 20" S. The nearest Kenya Meteorological rainfall stations are the Muguga Forest Station 7 kilometers south of the site, and Mabroukie – 6 kilometers north of the site. It is illustrated in Figure 1 (a) and (b) that the hydrographs for both stations are very similar, the difference being only in the amount of rainfall, which tends to increase northward. The mean annual precipitation at the latter is 1336 mm p.a and 987 mm p.a at the Muguga Forest area. Mabroukie is at 2347 m amsl while Muguga is at 2073 m amsl, an altitude difference of 274m; since Rironi is at 2270 m amsl it is therefore possible that the annual precipitation approaches 1100mm p.a. Rainfall is bimodal and is heaviest April-June (main season) and lighter October-November. Mean maximum daily temperature is 23 °C and minimum 12 °C.

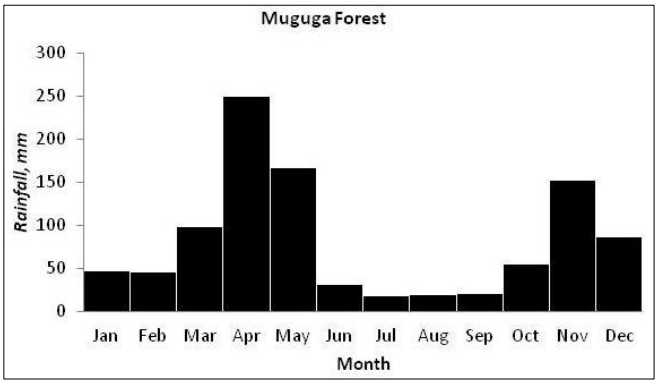


Figure 1a. Muguga Forest, KMD Station No.9136043

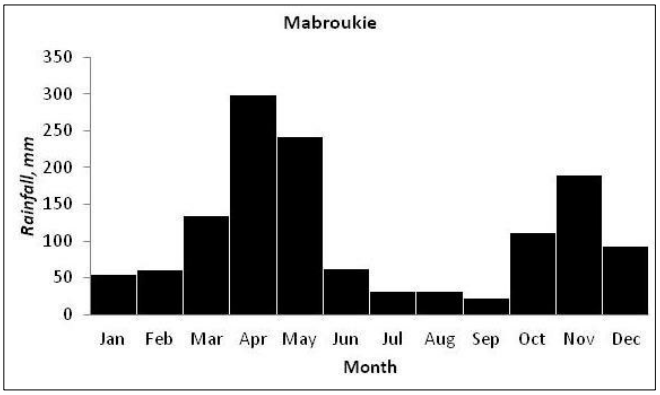


Figure 1b. Mabroukie station, KMD Station No. 9136065

1.2 Soils and vegetation

The area has deep red soils with high fertility, mainly nitisols of volcanic origin. Much of the natural vegetation has been replaced by farming activities; forested areas in the valleys comprise exotic blue gum and wattle trees.

1.3 Regional geology

Broadly, the Nairobi area is covered by Tertiary volcanic rocks in the following stratigraphic order:

i. Limuru Trachyte
ii. Tigoni Trachyte
iii. Karura Trachyte
iv. Kabete Trachyte
v. Kerichwa Valley Series tuffs

Limuru trachyte belongs to the Upper Trachyte division, while the others belong to the Middle Trachyte division of Saggerson, 1991[1], (Figure 2). Weathering of previously laid lava flows led to the formation of erosional and depositional layers in between the volcanic units, referred to as "old land surfaces" in older geological logs.

1.3.1 Limuru Trachyte

This unit forms one of the thickest individual lava flows and may reach over 152m, especially where it is intercalated with trachytic and agglomeratic tuffs. It is a soft, but rarely fissile member, highly porphyritic with truncated feldspar laths in a pale groundmass. In thin section, the rock contains large anorthoclase phenocrysts in a matrix of untwinned orthoclase.

1.3.2 Tigoni Trachyte

Also known as the Karura Quartz Trachyte, it outcrops mainly in the Tigoni area and is at least 60m thick. There is evidence that it occurs in at least 2 lava flows, separated by sediment and tuff. It is very fine-grained, dull grey with a flaggy appearance and exhibits colour banding on weathered surfaces.

1.3.3 Kabete Trachyte

This unit typically outcrops in the Kabete area, as the name suggests. It is a grey-green porphyritic rock of granular appearance, but where weathered has a soft grey color. It overlies both the Kerichwa Valley tuffs and the Nairobi Trachyte and is apparently a relatively narrow lava flow, at least 30m thick.

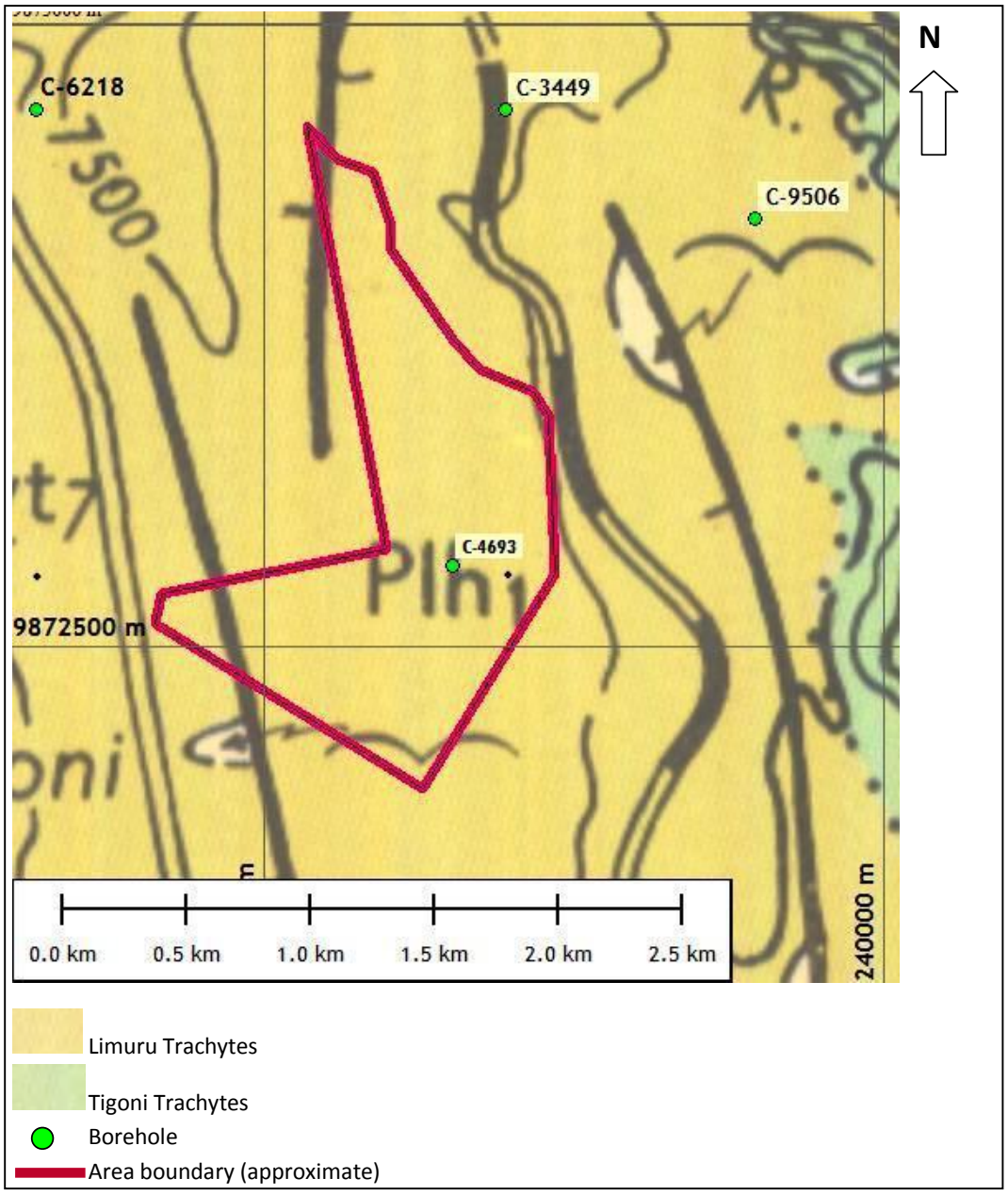
1.3.3 Kerichwa Valley Tuffs

Consisting of pyroclastic ash and pumice flows, trachytic tuffs and agglomerates, this unit covers large areas of Nairobi. Its various members were not laid down in one volcanic event; rather, the tuffs are distinguished by lower, middle and upper members. In terms of

[1] *Geology of the Nairobi Area, Report No. 98; E.P. Saggerson, 1991, Mines and Geology Dept. Nairobi*

occurrence, Lower and Middle Tuffs are found mainly in valleys, with the Upper Tuffs being more ubiquitous.

The various colours of the tuffs should not be confused to represent different units; generally they may be grey, mauve, and buff-coloured or greenish, jointed or welded tuff.



Extract from Geological Report No. 98: Geology of the Nairobi Area, E.P.Saggerson

Figure 2. Geological map showing location of investigated site

1.4 Local geology

The site is located in an area underlain by a thick flow of the Limuru Trachyte; an outcrop of the Tigoni Trachyte about 1.5 km east of the site indicates this unit underlies the Limuru trachyte in the area. Deep wells may strike the Upper and Middle Kerichwa Valley tuffs.

1.5 Geomorphology

The 90m digital elevation model (DEM) extract within the location of the site shows that it is located on a slice or block of volcanic flow that is carved by conjugate faulting. The main faults that run due N-S are dissected by NW-SE orthogonal faults.

In such cases where the main faults are hydraulically joined via cross-cutting minor faults, the latter are excellent for locating boreholes, because they act like collector pipelines depending on the geometric placement of the aquifer units they affect. Clearly however, the current project site is off the main fault and also off the cross-cutting fault except on its north tip. This unique placement must be considered when making the site selections. The approach will consider reducing the thickness of the fault clock to be penetrated as much as possible. Groundwater occurrence will be directly affected by this relationship, as shall be discussed under hydrogeology.

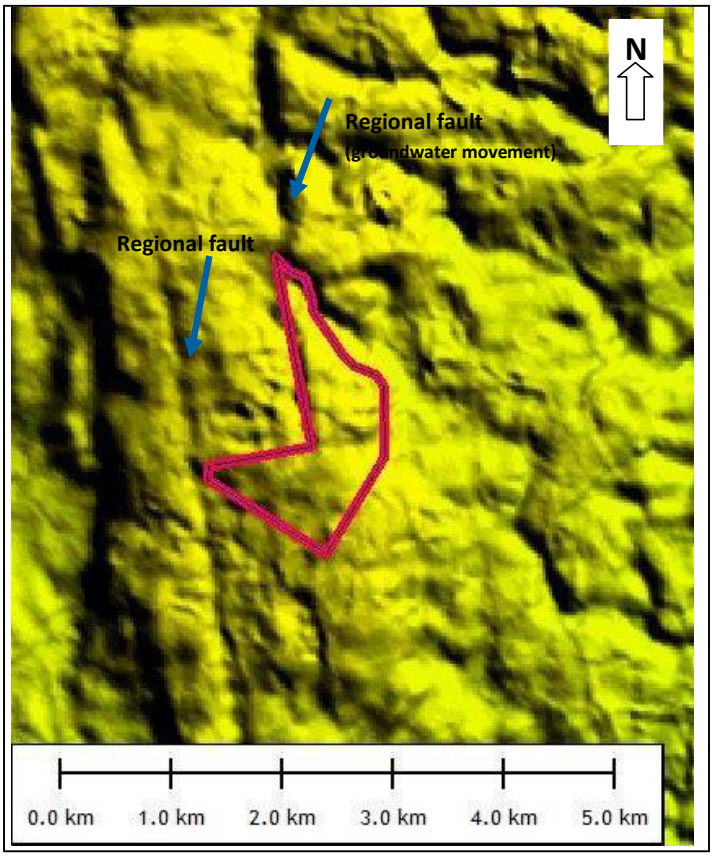


Figure 3. DEM covering the project site; note that it is geomorphologically located on a raised fault block

2 HYDROGEOLOGY

2.1 Aquifer occurrence

Review of the data from boreholes thus far drilled in the area gives insight into the types of aquifers found. There is a medium-depth aquifer in the graben features (less than 100m deep); on the fault block proper the main aquifer tends to be quite deep (>200m), but boreholes drilled closer to the fault zones could have more than one water strike in the intermediate depths. All are intervolcanic aquifers.

Table 2-1. Data for neighbouring boreholes

BH ID	Owner	Total Depth, m	Water strike, m	Static level, m	Tested yield, m^3/ hr	Drawdown, m
	James Kanyotu	260	230	114.57	5.6	
C-3449	Buxton	183	55, 142, 176	138	1.1	12.8
C-4693	Buxton	160	132	76	8.7	69
C-5048	Rironi Water Project	202	130, 166	135	12	4
C-9506	Thande, Ishmael	127	18, 90	57	13.6	23.1

Source: WRMA

Figure 4 shows a hydrogeological section from the northern part of the catchment to the south up to Kikuyu Springs. It shows the Limuru Trachytes unit is very thick in Rironi area and that, apart from aquifers in this unit there are likely to be deeper aquifers in the contact zones between successive volcanic flows.

It is instructive that the James Kanyotu borehole west of the property struck its main aquifer at 230 metres which is quite deep, compared to 90 metres for C-9506 that is further east of the property. Aquifers to the east are therefore far easier to exploit. Furthermore, there are a number of streams at the eastern end of the section, which derive their baseflow from these aquifers, especially the contact between Limuru and Tigoni trachytes. Therefore, the Limuru Trachyte/ Tigoni Trachyte contact is a significant intervolcanic aquifer especially if struck at a suitable location.

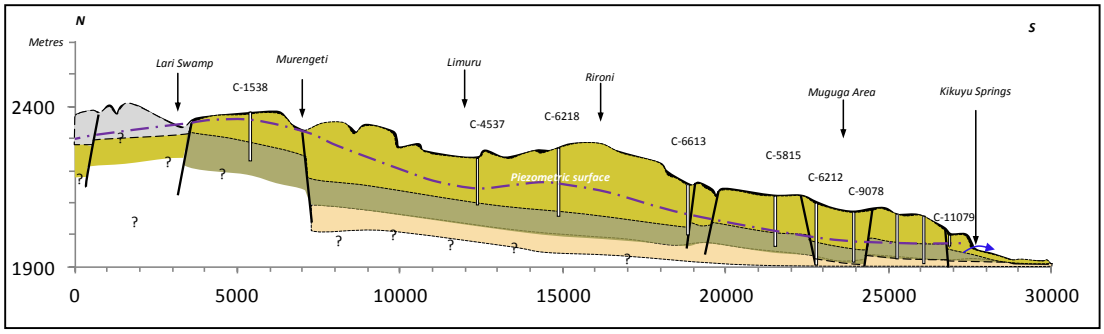


Figure 4. Hydrogeological section A-B (refer geological map).

It is noted that most boreholes in the area strike only one or a second, much deeper aquifer. One of the reasons has been clarified in the preceding paragraph. The other is because the Tigoni Trachyte itself also has water-storing qualities; an aquifer may therefore exist either in the fractured zones of this unit, or at its base contact with the underlying lava flow.

Given that the area is faulted, sites on the fault blocks are influenced by deep groundwater circulation so boreholes must be drilled deeper in order to reach the groundwater flux.

2.2 Aquifer characteristics

2.2.1 Yield

The reported yield in the area is generally more than 5 m^3/ hr, but the median yield is at least 8 m^3/ hr (Table 2-2). This is more than the median yield for Limuru-Kikuyu-Kiambu area, which is 7.2 m^3/ hr. Yield is bound to improve where the borehole penetrates the full aquifer. In this respect, it is important that a borehole that aims for the second aquifer should fully penetrate the Tigoni Trachyte unit.

The yields reported here are however still lower than the desirable yields for the proposed boreholes, which should average at least 12 m^3/ hr; this does not appear unrealistic, given that a number of boreholes in the area have attained a similar yield.

Table 2-2. Hydraulic parameters of the boreholes around the property

BH ID	Tested yield, m^3/ hr	Drawdown, m	Specific capacity, l/s/m	Transmissivity, m^2/ day
C-3449	1.1	12.8	0.024	2.5
C-4693	8.7	69	0.035	3.7
C-5048	12	4	0.833	87.8
C-9506	13.6	23.1	0.164	17.2

2.2.2 Specific capacity

The specific capacity of the aquifers here is relatively uniform, ranging from 10^{-1} to 10^{0}. It can however drop to 10^{-2}; the boreholes that are nearest to the property (C-3449 and C-4693) generally show low specific capacity of the order of 10^{-2}. Such a magnitude of

specific capacity reflects limited groundwater potential that is only suitable for small withdrawals for local water supply (domestic consumption). It is important therefore that the proposed sites should be suitably located to target aquifers with better specific capacity.

2.2.3 Transmissivity

Transmissivity range varies widely and expectedly so, given that directional transmissivity along fault lines will be quite apart from matrix transmissivity in the fractured rock. Thus Logan's transmissivity values vary from as little as 2.5 to nearly 90 m^2/ day. According to the Stuckmeyer and Margat (1995) classification of aquifers, transmissivity of 5 – 75 m^2/ day denotes moderate groundwater potential with yields of up to 36 m^3/ hr. For the current site, such transmissivity can only be obtained in boreholes intercepting faults hence their location must deliberately go for these areas in order to maximize the potential to strike a rich yield.

2.3 Groundwater recharge

Recharge to the aquifers in the area is mainly through lateral inflow from the north, originating at the southern edge of the Aberdares (south east of the Kinangop Plateau). Such flows are not easily quantifiable hence actual recharge flow through the area cannot be accurately determined. However, according to some estimates (see for example the Kikuyu Springs Aquifer Study, Norken 2011), over 5 MCM of groundwater recharge flows into the larger catchment area from the north.

This flux moves across a front of about 6 kilometers wide. Given that the property under review spans about 1 kilometer wide, the average recharge flux through it is therefore estimated to be the average for 5 MCM flow over the 6 kilometers, which is 830,000 m^3/ year.

It must be emphasized that this is a mere average, yet ground conditions are seldom homogeneous across an aquifer. There are bound to be huge lateral variations that one must be alive to when making assumptions.

2.4 Groundwater flux

According to data obtained from the Study on the Preliminary Water Allocation Plan for the Nairobi Aquifer Suite, the area under investigation is underlain by the Upper Trachyte Aquifer. This aquifer has a median discharge of 7.2 m^3/ hr, but there is a 14% chance of striking twice this yield if the yields of existing boreholes around the area are taken into account (Table 2-1).

Transmissivity in this aquifer is generally between 1 and 10 m^2/ day but may reach into the hundreds along the fault zones. Both the upper and the lower aquifer share the same characteristics. This information is corroborated by the limited data form boreholes around the property: two have $T<10$, one has $10<T<20$ while the other has $50<T<100$ m^2/ day.

The evaluation of groundwater flux is important because it provides the means to assess the potential groundwater available for abstraction within a given area. Flux is determined by the width and thickness of the groundwater transmitting medium, the hydraulic gradient

between entry and exit of the area through the medium and the permeability of the medium. The permeability and thickness are combined together in the relationship below:-

T=Kb, where T is the transmissivity of the aquifer, K its permeability and b its thickness.

From Table 2-2, transmissivity of the aquifer here is varied, but based on the data available is between 2 and 90 m^2/ day. Taking 2 to be on the low side and 90 on the high side, a median value of 45 m^2/ day is assumed for purposes of flux calculations. Hence,

Flux = TiW and flux = 45 x 0.02 x 1000 = 900 m^3/ day.

2.5 Water quality

The project area is within the main recharge zone for the Nairobi Aquifer Suite. Consequently, water quality is not a major concern; unless there are rare undesirable concentrations of elements.

A 2006 water quality analysis for C-416 and C-5048 boreholes to the south of the property gave the electrical conductivity of less than 200 µS/cm – fresh water (Table 2-3). Fluoride was less than 0.5 ppm and iron < 0.2 ppm.

Table 2-3 Water analysis results, March 2006

PARAMETERS		**RESULTS**		**KEBS guidelines**
	UNIT	**C-5048**	**C-416**	KS 05-459: Part 1:1996)
pH	-	6.4	6.5	6.5-8.5
Colour	mgPt/l	<5	8	15
Turbidity	N.T.U	1.1	7.1	5
Conductivity (25^0c)	µS/cm	179.6	171.4	2000
Iron	mg/l	0.16	0.15	0.3
Manganese	mg/l	< 0.01	0.01	0.1
Calcium	mg/l	8.8	10.4	250
Magnesium	mg/l	6.32	4.9	100
Sodium	mg/l	16.5	15.5	200
Potassium	mg/l	5	5	-
Total hardness	mg$CaCO_3$/l	48	46	500
Total Alkalinity	mg$CaCO_3$/l	34	36	500
Chloride	mg/l	31	31	250
Fluoride	mg/l	0.4	0.2	1.5
Nitrate	mgN/l	1.1	1.2	10
Nitrite	mgN/l	<0.01	<0.01	
Ammonia	mgN/l	_	_	0.5
Total Nitrogen	mgN/l	_	_	-
Sulphate	mg/l	6.28	0.6	400

PARAMETERS	UNIT	RESULTS		KEBS guidelines
		C-5048	C-416	KS 05-459: Part 1:1996)
Orthophosphate	mgP/l	_	_	
Total suspended Solids	mg/l	_	_	NIL
Free Carbon Dioxide	mg/CO_2l	4	8	-
Dissolved Oxygen	mgO_2/l	_	_	-
Total Dissolved Solids	mg/l	111.4	106.3	1500

KEBS- Kenya Bureau of Standards

2.6 Interference effects

This is an important part of the hydrogeological assessment because the property wishes to develop a number of boreholes. The minimum distance between any two boreholes that will not result to interference should therefore be established.

Interference causes increased dynamic water levels, accelerating depletion of aquifers and generally thereby increasing pumping costs when pumps have to be installed at deeper levels to avoid cutting out due to low water.

The analysis determines the radius of the cone of depression of a pumped borehole in the aquifer within the area in a given period, say 24 hours (Figure 5).

Table 2-4. Radius of influence of wells in the area

BH ID	Radius of influence, m
C-3449	38
C-4693	53
C-5048	38
C-9506	52

Data in the Table 2-4 is quite consistent, showing that the radius of influence for boreholes in the area is between 38 and 53 metres. This means that the minimum safe distance that boreholes should be drilled apart is 106 metres if interference is to be avoided.

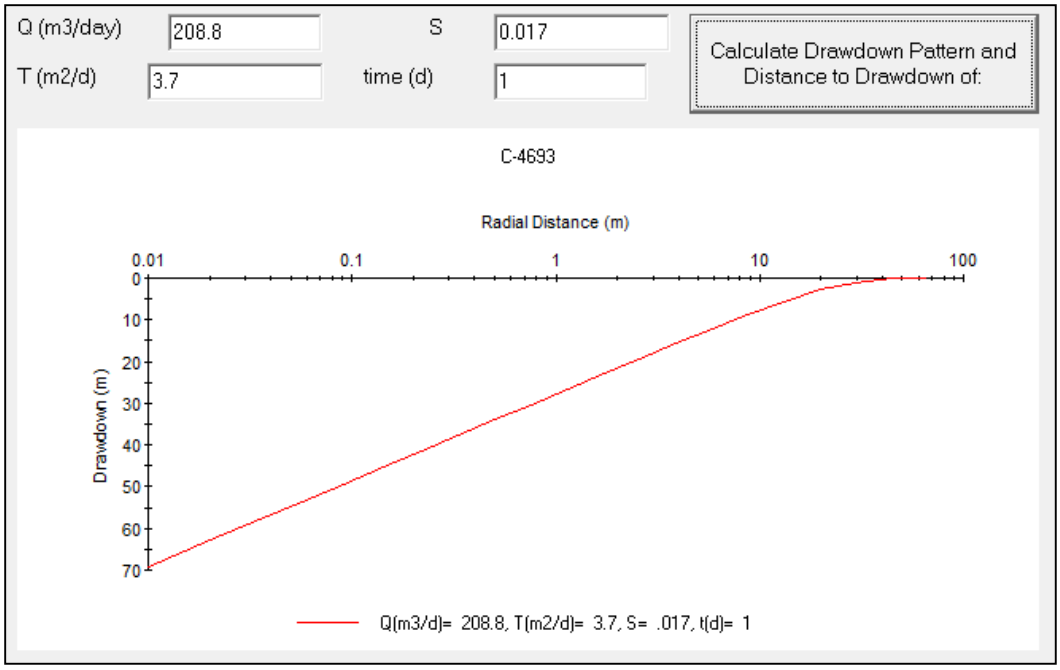


Figure 5. Graphical determination of the cone of depression of well C-4693 on the estate; radius of influence 53 metres.

2.7 Analysis of the Reserve

As a rule (WRMA, 2007) the hydrogeological report must present an analysis of the Reserve. In this respect, the Reserve is affected by actions of water abstraction (both surface and groundwater) that would impact on its quantity and quality.

So far, no Reserve volume or quality has been set aside for the aquifer suite in which the study area falls. Notwithstanding, the site is located immediately south of the boundary of the proposed Groundwater Conservation Area (GCA) by the Water Resources Management Authority for the Kikuyu Springs Catchment. This means the area is not affected by conditions that will be imposed on groundwater development and use in the GCA once it is gazetted.

The area is however within the proposed Groundwater Protection Zone (GPZ) for the same aquifer. Although the gazettement is under process, some of the likely controls to be imposed on the groundwater use environment include:

a) Restrictions on activities that pose pollution threat: e.g., effluent that is not treated to a quality safe for release into the environment;
b) Regulation of activities that may result to excessive nitrate loading of the groundwater;
c) Checks on activities that may result to accidental release of harmful industrial compounds into the groundwater;
d) Strict regulation of water allocation – WRMA reduces the caps on the maximum daily abstraction amounts permitted for various kinds of uses;

e) Prioritising of allocation of water resources to users, with domestic water supply taking priority over agricultural, commercial and industrial uses;

The main groundwater dependent ecosystems (GDE) that is found within the larger catchment are the Kikuyu Springs and Ondiri Swamp; to a smaller extent Manguo Swamp. It is estimated that the Kikuyu Springs accounts for 25% of current groundwater withdrawals from the system (Norken 2011). Given that the current total abstraction is just shy of 70% of the annual recharge, the springs therefore require a maximum of 20% of the total annual recharge to maintain the natural flow conditions. Another 10% may be allocated as other ecological reserve bringing the total proposed ER to 30%. Some communities depend on hand dug wells in the catchment therefore a basic human needs reserve (BHNR) is also required. This is usually a smaller fraction of the ER, hence an assumed total Reserve of 40% is suggested.

The proposed Reserve is therefore 40%, indicating that the maximum allowable allocations should be 60% of the potential yield.

3 FIELD ASSESSMENTS AND ANALYSIS

3.1 Hydrogeological traverse

The survey team traversed the whole property seeking for structural and landform features of hydrogeological significance. These included valley sides and bottoms, faults and depressions, as well as geological outcrops and contacts.

3.2 Electrical resistivity surveys

The electrical resistivity method was used to acquire field data about the underlying geology, and more especially factors that would be conducive to groundwater occurrence. The method uses non-invasive remote sensing techniques based on Ohm's Law to detect vertical or lateral changes in ground resistivity. Since resistivity is a function of the state of weathering of the rock strata, which is influenced by the occurrence of pore water, the observed variations are used to determine the aquifer zones underground.

By Ohm's Law,

$$R = V/I, \qquad (1)$$

where R = resistance, V = voltage, and I = current

Resistance will vary depending on the distance and geometry between the probes so it is normalized with the addition of a geometric factor that converts the measurement to apparent resistivity, ρa, (expressed in ohm-meters):

$$\rho a = 2\pi a V/I, \qquad (2)$$

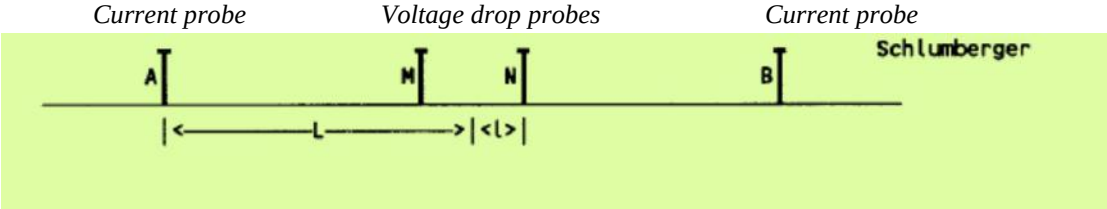


Figure 6. Illustration of the Schlumberger array arrangement

These field electrical resistivity layouts may be used to conduct vertical electrical resistivity sounding (VES) or horizontal electrical resistivity profiling (HEP).

3.2.1 Horizontal electrical profiling (HEP)

HEPs are used to locate structural discontinuities such as faults and weathered zones of greater depth but small lateral extents. Five HEPs were executed for purposes of picking out the N-S trending fault zones that may run across the estate. Following execution of the profiles, at least 18 locations were selected for VES.

3.2.2 Vertical electrical soundings (VES)

For data acquisition, the vertical electrical depth probing technique was used, using the Schlumberger array. Data acquired was processed using Interpex IX1D software which is used for forward and inverse modeling of resistivity data. In simple terms, the software approximates the ground characteristics that would give the kind of resistivity signal delivered by the instrument during the data acquisition process. It relates ground strata resistivity and their thickness to derive a best-approximation model of the ground.

The following table illustrates the forward model of the ground depth-resistivity relationship from the site.

Table 3-1. Inverse resistivity models for the selected VES Sites

Depth (m)	Resistivity (Ω-m)	Interpretation	Remarks
VES 1 GR 238179E, 9874230N (WGS 84), Alt. 2273m amsl by GPS			
0 - 0.5	796	Boulders in soil	
0.5 - 1.4	69	Weathered lateritic material	
1.4 - 3.4	749	Trachyte boulders	
3.4 - 12.1	113	Weathered trachytes	
12.1 - 37.2	410	Linuru trachytes	
37.2 - 111.4	61	Highly weathered trachytes	Aquifer
Over 111.4	259	Tigoni trachytes	
Site 2 VES GR 237951E, 9874352N, (WGS 84), Alt. 2266m amsl by GPS			
0 - 0.5	183	Reddish-brown clay loam soil	
0.5 - 2.1	17	Weathered lateritic material	

Depth (m)	Resistivity (Ω-m)	Interpretation	Remarks
2.1 - 11.9	22	Weathered trachytes	
11.9 - 25.5	13	Intervolcanic sediments	
25.5 - 80.1	104	Weathered trachytes	
Over 80.1	39	Highly weathered trachytes	Aquifer after 80 metres
Site 3 VES GR 237937E, 9874456N, (WGS 84), Alt. 2264m amsl by GPS			
0 - 0.6	50	Dark silty soils	
0.6 – 2.5	10	Clayey sediments	
2.5 – 13.2	28	Weathered trachytes	
13.2 – 23.1	11	Intervolcanic sediments	
23.1 – 67.5	117	Weathered trachytes	
Over 67.5	55	Highly weathered trachytes	Aquifer at base
Site 4 VES GR 238258E, 9873990N, (WGS 84), Alt. 2254m amsl by GPS			
0 - 0.7	100	Reddish-brown clay loam soil	
0.7 - 4.9	29	Weathered lateritic material	
4.9 - 24.2	152	Weathered trachytes	
24.2 – 48.3	53	Intervolcanic sediments	
48.3 - 105.5	118	Weathered trachytes	
Over 105.5	29	Highly weathered trachytes	Aquifer here and at depth
Site 5 VES GR 238545E, 9873423N, (WGS 84), Alt. 2263m amsl by GPS			
0 - 0.9	93	Reddish-brown clay loam soil	
0.9 - 2.9	20	Weathered lateritic material	

Depth (m)	Resistivity (Ω-m)	Interpretation	Remarks
2.9 - 8.2	106	Weathered trachytes	
8.2 - 19.8	53	Intervolcanic sediments	
19.8 - 58.7	386	Fresh trachytes	
Over 58.7	72	Highly weathered trachytes	Aquifer at base
Site 6 VES GR 238804E, 9872959N, (WGS 84), Alt. 2263m amsl by GPS			
0 - 0.5	310	Trachyte boulders in soil	
0.5 - 1.8	48	Weathered lateritic material	
1.8 - 6.2	108	Weathered trachytes	
6.2 – 61.0	234	Trachytes	
Over 61.0	79	Highly weathered trachytes	Aquifer at base
Site 7 VES GR 238424E, 9872225N, (WGS 84), Alt. 2254m amsl by GPS			
0 - 7.2	41	Laterite	
7.2 - 24.5	136	Weathered trachytes	
24.5 - 68.6	520	Fresh trachytes	
Over 68.6	41	Highly weathered trachytes	Deep aquifer at base
Site 8 VES GR 238496E, 9873635N, (WGS 84), Alt. 2251m amsl by GPS			
0 - 0.6	236	Boulders in reddish soil	
0.6 - 5.1	38	Laterite	
5.1 - 19.2	168	Slightly weathered trachytes	
19.2 – 42.0	106	Weathered trachytes	
42.0 - 93.0	453	Fresh trachytes	
Over 93.0	81	Weathered trachytes	Aquifer at depth

3.3 Analysis

The VES models are typical of volcanic formations, having mostly 6 layers, with the exception of one 5-layer and one 7-layer model. For all the models, the aquifer layer is invariably weathered Limuru trachytes; at VES Site 1 the aquifer is at the weathered contact between the Limuru and Tigoni trachytes. Actual aquifer depth is greater than what is indicated in the models. This discrepancy is attributed to the fact that the Limuru trachytes unit is quite thick hence there is signal suppression that could lead to poor depth resolution. It is therefore advisable to multiply the model depth by a factor of roughly 1.6.

In this regard therefore, aquifers are indicated at the following depths:

- Site 1: Up to 180 metres below ground level (bgl)l;
- Site 2: Up to 130 meters bgl;
- Site 3: Up to 108 meters bgl;
- Site 4: Up to 168m bgl;
- Site 5: The main aquifer will be deeper than 250 meters;
- Site 6: The main aquifer is more than 200 meters deeper;
- Site 7: The aquifer is deeper than 170 meters;
- Site 8: Similar to site 5, at more than 250 meters.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The estate has moderate groundwater potential, which can only be tapped by drilling boreholes at the fringes of the property in the low elevation areas along the valleys. This is because these valleys owe their origin to fault features hence boreholes drilled along them would most likely intercept the faults, thereby increasing the probability for water strikes and good yields.

It has been demonstrated that the minimum distance between boreholes that will not lead to interference between them is approximately 110 metres. Consequently, the property can hold at least 8 boreholes along its northern and eastern boundary. When the western boundary is considered then it is possible that additional boreholes may be accommodated, depending on the water resource allocation available. There are 2 existing boreholes that are assumed to tap the flow on the western side of the estate.

4.2 Proposed borehole site and recommendations

The proposed borehole sites and drilling depths in order to penetrate the aquifers fully are as tabulated in Table 4-1. All the sites are known to Mr John Ekiring, a staff at the estate.

Table 4-1 Proposed boreholes

Site ID	UTM Easting (WGS 84)	Northing	UTM Easting (Arc 1960)	Northing	Recommended depth (m)	Anticipated yield (m3/hr)
Site 1	238179	9874230	238085	9874530	280	8
Site 2	237951	9874352	237857	9874652	250	15
Site 3	237937	9874456	237843	9874756	250	15
Site 4	238258	9873990	238164	9874290	280	8
Site 5	238545	9873423	238451	9873723	300	12

Site 6	238804	9872959	238710	9873259	250	12
Site 7	238424	9872225	238330	9872525	300	8
Site 8	238496	9873635	238402	9873935	300	8

It is recommended that for purposes of works estimates, an allowance of 20 metres extra over the recommended depth be allowed for in case there is need to drill deeper. Other overriding recommendations for construction are:-

i. Diameter: the open-hole diameters shall be 8inches minimum; the production diameter shall be 6 inches.
ii. Materials: Well casing shall be mild steel manufactured in accordance with applicable parts of ASTM A 139 Grade B, with the following additions:
    a. Welding shall be by the butt welding arc process using at least two passes on the outside.
    b. Casing shall be 6 ¼ inches outside diameter and ¼ inch wall thickness.
    c. Casing shall be furnished in 6 metre lengths.
iii. Screen slot size: it is expected that the aquifer material is composed of weathered trachyte rock and in some cases sediments of volcanic nature, mostly fine to medium grained. 1mm slots are recommended. The minimum gravel size shall therefore be 2mm; however the pack material should be wells graded in size between 2-5mm of well rounded silica sand.
iv. Direct air-assisted rotary drilling with down the hole hammer (DTH) is recommended. However, temporary casing will be required due to possible running sediments.
v. It is anticipated that air losses will occur and drill cuttings may sometimes be lost down cavities. The contractor should be prepared for these conditions and be ready to use remedies such as cellulose or cement grouting.
vi. All boreholes shall be tested at a constant rate for 24 hours and allowed to recover fully after pump shut down.
vii. During each subsequent test, the previous drilled bore shall be used as a monitoring well for the current test.
viii. The expected yields of the boreholes will vary between 8 and 15m^3/hr; lower or higher discharges may however be realized.
ix. We recommend installation of automatic water level recorders in each bore after completion and during production.
x. The Applicant is advised to refer to the Kenya Gazette for registered drilling contractors and liaise with an experienced hydrogeologist for advice.

4.3 Impacts of the boreholes

4.3.1 Borehole density

The proposed boreholes are between 110 and 825 meters from each other; this is well beyond the minimum distance of 110 meters determined for the aquifer. The anticipated borehole density will therefore not contravene the desirable minimum distance.

4.3.2 Effects on water quality

The aquifer here has one of the best water qualities in the Nairobi Aquifer Suite. No adverse effect on the water quality is expected as long as the abstraction is kept within the recommended local ecologically sensitive level of 60% of the potential yield.

4.3.3 Effects on other abstractors

The nearest abstractor to a borehole located on the property is 400m from the proposed site. This abstraction point is located on the ante-side of the faulted valley hence it is subject to different aquifer conditions. No effect is anticipated.

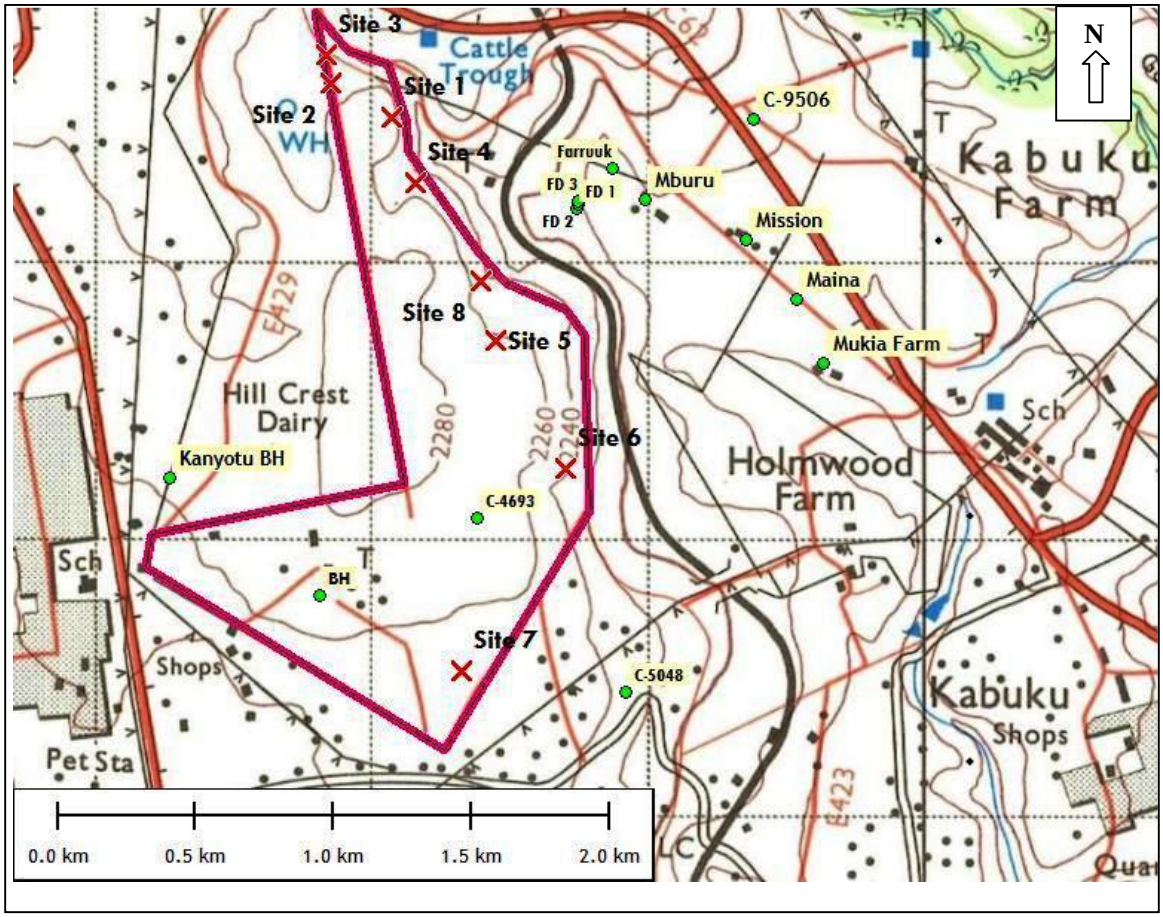


Figure 7. Extract from Sheet 148/1, SK 1:50,000 series, showing the selected sites and neighboring boreholes

5 REFERENCES

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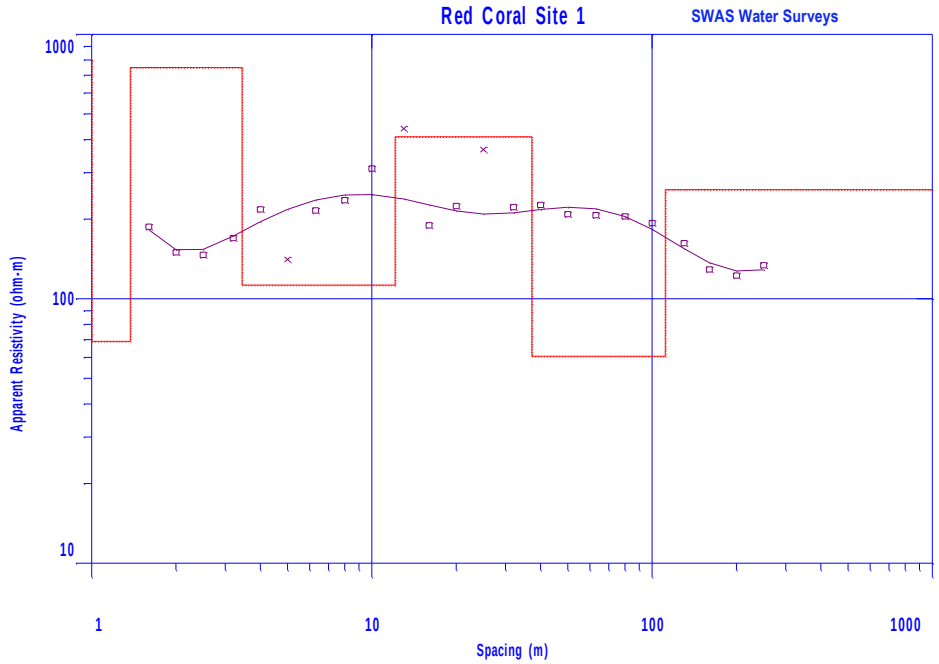
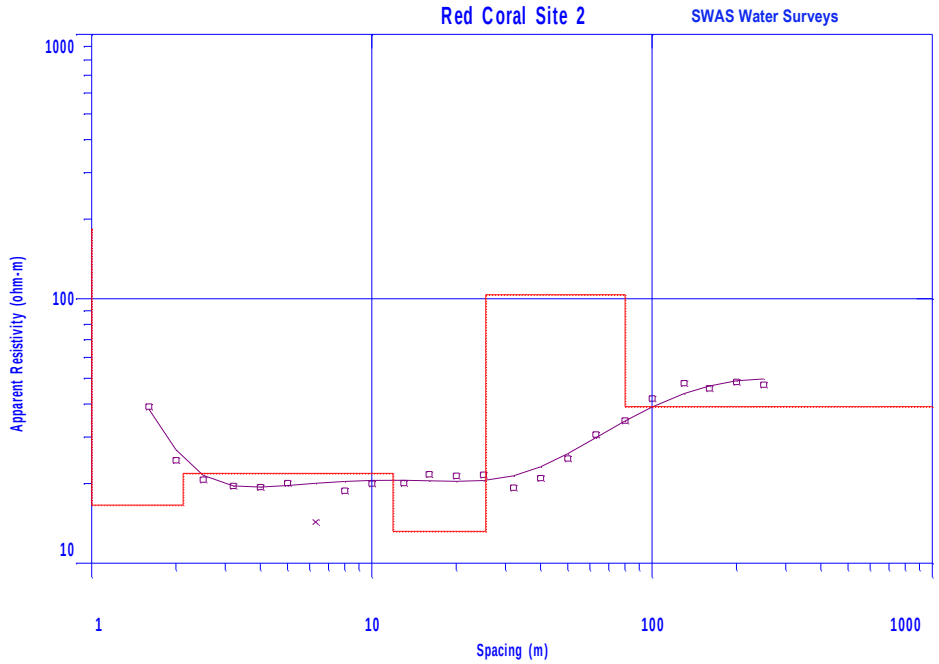
APPENDIX 1: RESISTIVITY DATA PLOTS AND MODELS

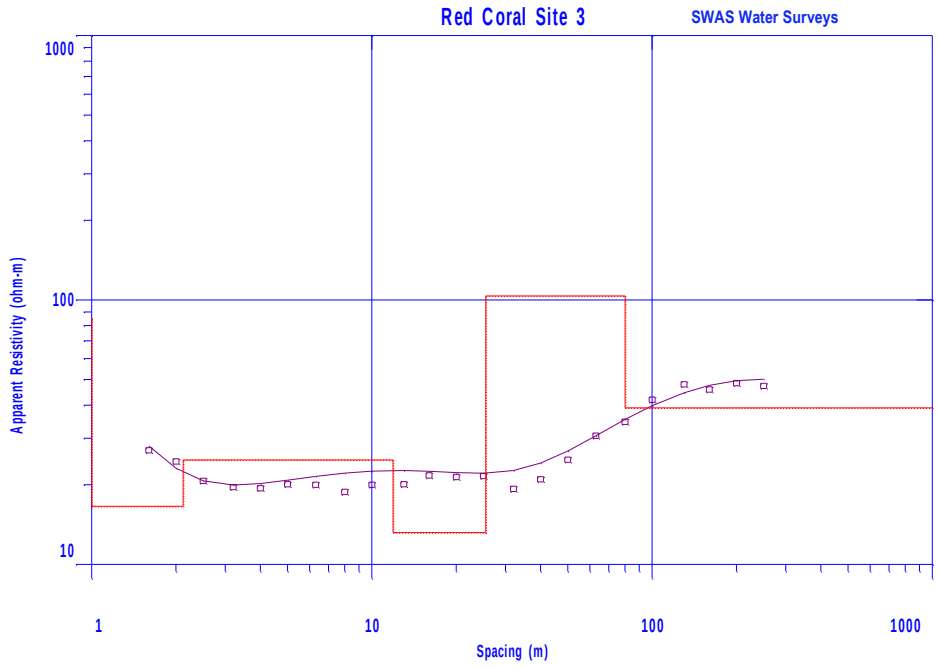
This Section presents all the VES data collected including the selected VES sites which are discussed in the main report.



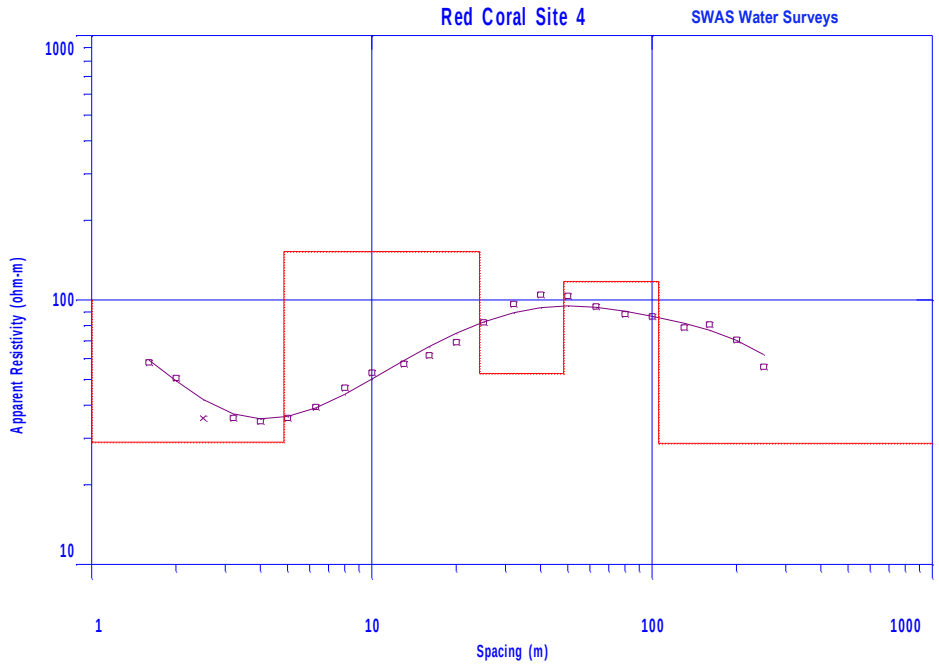
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	187.30		796.20	0.44963
2	0.5	149.90		68.998	1.3738
2.5	0.5	146.60		748.84	3.4410
3.2	0.5	169.60		112.63	12.096
4	0.5	217.80		409.84	37.222
5	0.5	140.80		60.583	111.43
6.3	0.5	215.80		258.69	
8	0.5	236.00			
10	0.5	310.80			
13	0.5	440.00			
16	0.5	189.50			
20	0.5	224.30			
25	0.5	366.50			
32	10	222.20			
40	10	226.40			
50	10	208.93			
63	10	207.07			
80	10	204.83			
100	10	193.31			
130	10	162.28			
160	10	129.10			
200	10	122.37			
250	10	133.89			



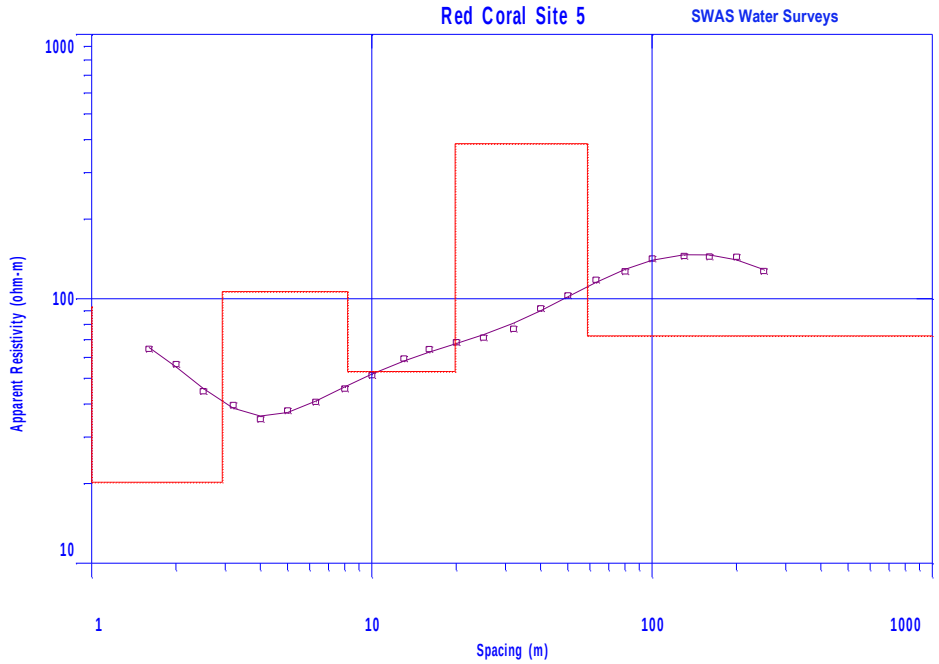
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	39.10		183.15	0.46483
2	0.5	24.50		16.586	2.1213
2.5	0.5	20.70		21.864	11.897
3.2	0.5	19.60		13.190	25.503
4	0.5	19.40		103.59	80.086
5	0.5	20.10		39.096	
6.3	0.5	14.30		183.15	
8	0.5	18.80			
10	0.5	20.00			
13	0.5	20.10			
16	0.5	21.70			
20	0.5	21.40			
25	0.5	21.60			
32	10	19.30			
40	10	20.98			
50	10	24.88			
63	10	30.66			
80	10	34.63			
100	10	41.96			
130	10	47.95			
160	10	45.86			
200	10	48.49			
250	10	47.30			



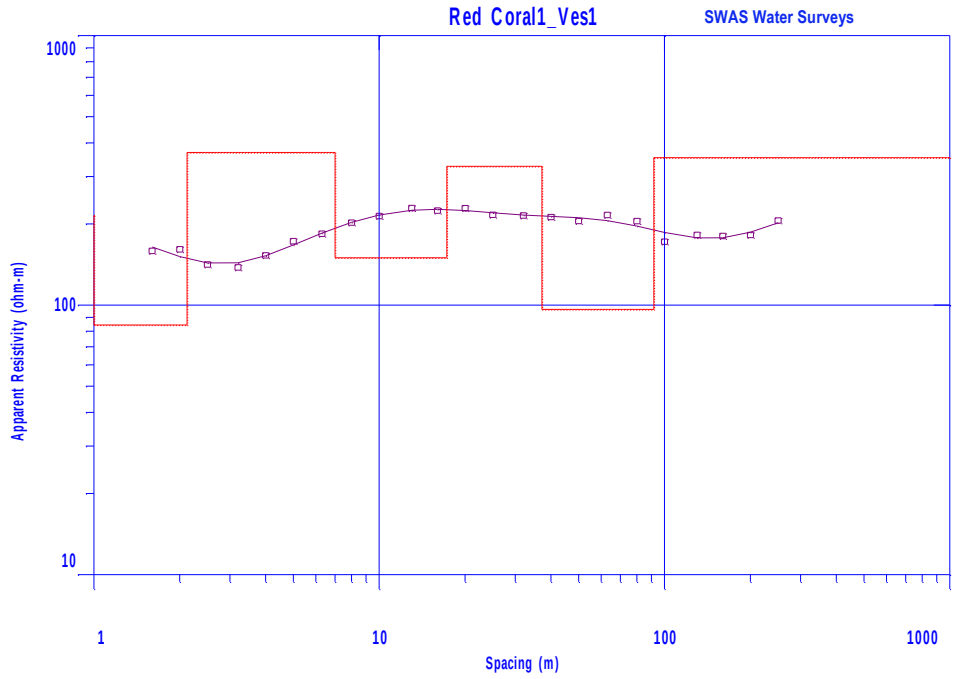
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	158.89		84.593	0.46483
2	0.5	161.08		16.586	2.1213
2.5	0.5	141.53		24.835	11.897
3.2	0.5	137.97		13.190	25.503
4	0.5	152.91		103.59	80.086
5	0.5	172.69		39.096	
6.3	0.5	183.96			
8	0.5	202.35			
10	0.5	214.08			
13	0.5	229.14			
16	0.5	224.31			
20	0.5	228.91			
25	0.5	216.38			
32	10	215.00			
40	10	212.20			
50	10	205.10			
63	10	216.00			
80	10	205.00			
100	10	172.00			
130	10	182.20			
160	10	180.50			
200	10	182.00			
250	10	206.00			



AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	58.10		99.724	0.69634
2	0.5	50.70		28.973	4.8544
2.5	0.5	35.70		152.43	24.200
3.2	0.5	35.80		52.723	48.318
4	0.5	34.80		117.49	105.45
5	0.5	35.80		28.690	
6.3	0.5	39.40			
8	0.5	46.60			
10	0.5	53.10			
13	0.5	57.38			
16	0.5	61.80			
20	0.5	69.30			
25	0.5	82.30			
32	10	96.60			
40	10	104.74			
50	10	103.61			
63	10	94.51			
80	10	88.54			
100	10	86.69			
130	10	78.71			
160	10	80.81			
200	10	70.74			
250	10	55.90			



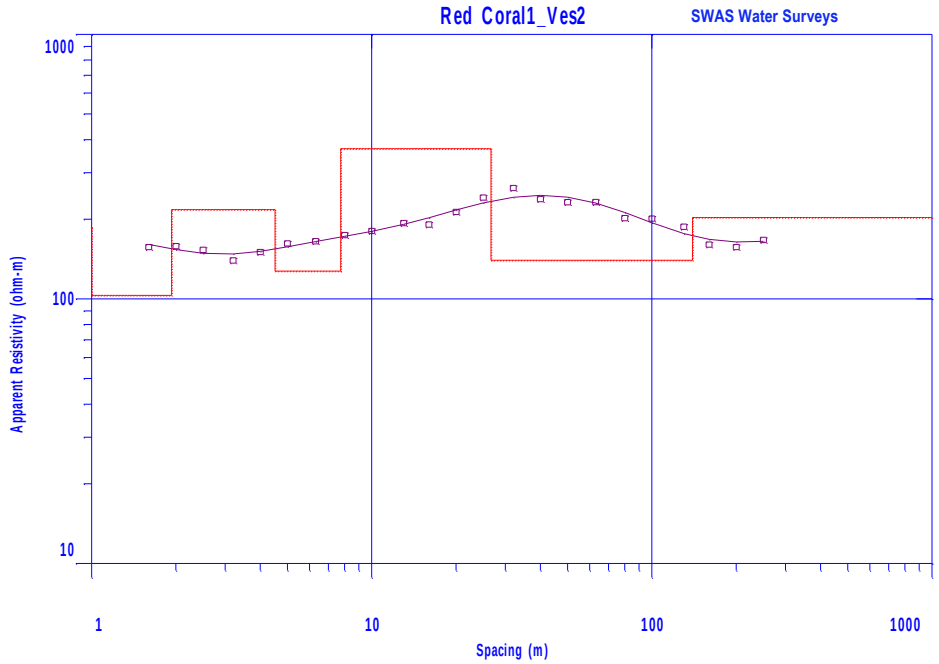
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	64.66		93.022	0.94324
2	0.5	56.62		20.236	2.9259
2.5	0.5	44.73		106.39	8.1894
3.2	0.5	39.63		53.083	19.820
4	0.5	35.10		385.97	58.740
5	0.5	37.82		72.385	
6.3	0.5	40.76			
8	0.5	45.75			
10	0.5	51.41			
13	0.5	59.45			
16	0.5	64.54			
20	0.5	68.51			
25	0.5	71.34			
32	10	77.00			
40	10	92.00			
50	10	103.00			
63	10	118.00			
80	10	127.00			
100	10	142.00			
130	10	145.20			
160	10	144.40			
200	10	144.20			



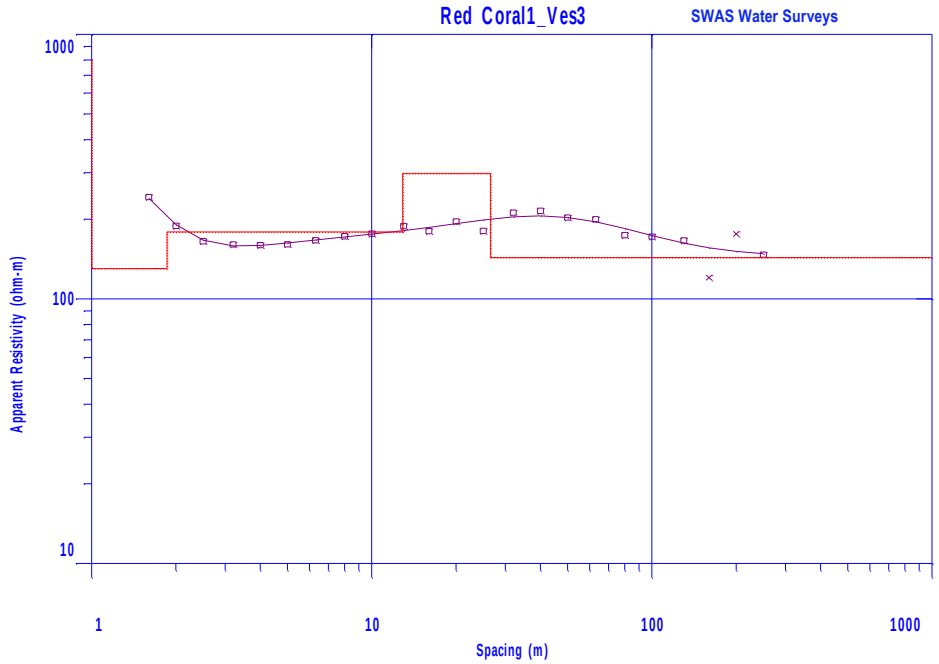
VES 1

MODEL

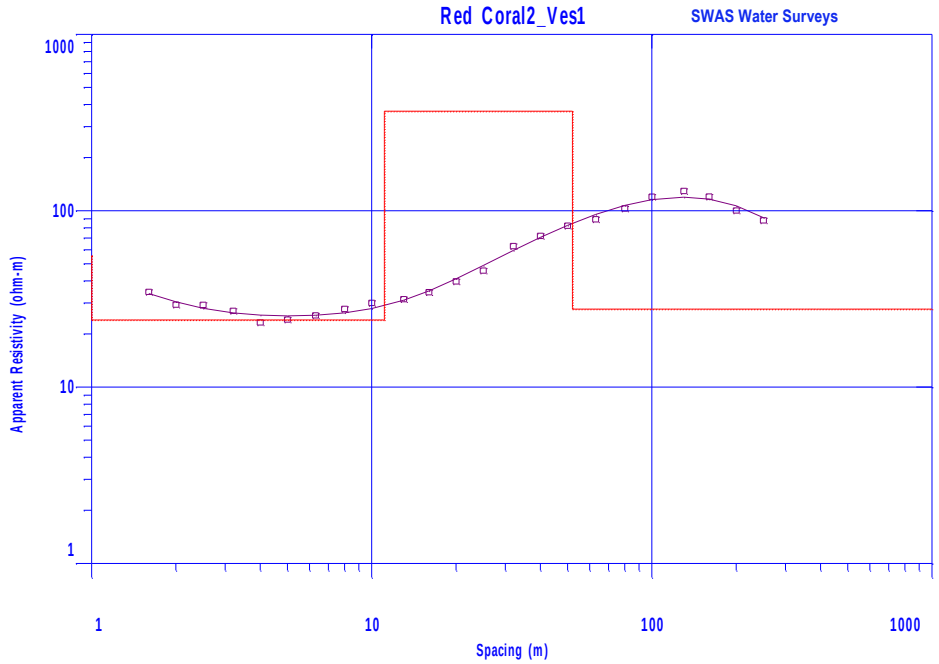
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	158.89		214.66	0.81389
2	0.5	161.08		84.350	2.1211
2.5	0.5	141.53		368.19	7.0041
3.2	0.5	137.97		149.91	17.261
4	0.5	152.91		327.37	37.181
5	0.5	172.69		96.386	91.732
6.3	0.5	183.96		352.52	
8	0.5	202.35			
10	0.5	214.08			
13	0.5	229.14			
16	0.5	224.31			
20	0.5	228.91			
25	0.5	216.38			
32	10	215.00			
40	10	212.20			
50	10	205.10			
63	10	216.00			
80	10	205.00			
100	10	172.00			
130	10	182.20			
160	10	180.50			
200	10	182.00			
250	10	206.00			



AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	157.01		185.67	0.87148
2	0.5	158.24		103.10	1.9304
2.5	0.5	153.19		217.68	4.5170
3.2	0.5	139.75		127.34	7.7479
4	0.5	150.35		369.85	26.626
5	0.5	162.06		139.92	139.69
6.3	0.5	165.14		203.06	
8	0.5	174.26			
10	0.5	180.55			
13	0.5	193.49			
16	0.5	191.02			
20	0.5	213.20			
25	0.5	241.55			
32	10	262.50			
40	10	238.40			
50	10	232.00			
63	10	232.30			
80	10	202.00			
100	10	201.20			
130	10	187.40			
160	10	160.40			
200	10	157.00			
250	10	167.00			

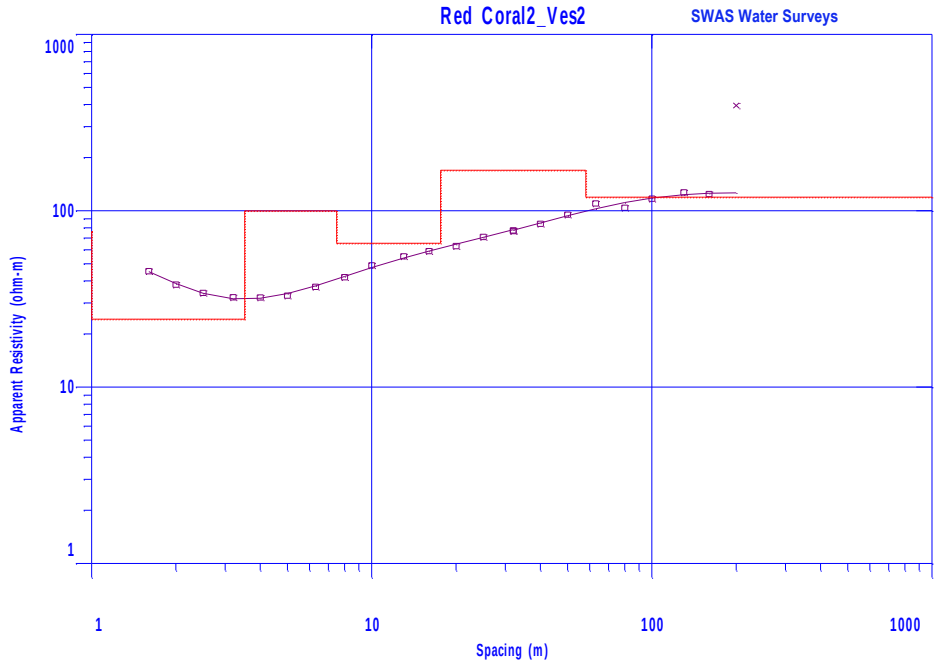


AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	242.68		801.36	0.47146
2	0.5	188.82		130.33	1.8577
2.5	0.5	165.12		179.14	12.898
3.2	0.5	160.65		298.14	26.531
4	0.5	159.72		143.34	
5	0.5	160.78			
6.3	0.5	166.57			
8	0.5	172.50			
10	0.5	176.45			
13	0.5	188.43			
16	0.5	180.40			
20	0.5	196.20			
25	0.5	180.66			
32	10	212.00			
40	10	215.20			
50	10	203.00			
63	10	200.00			
80	10	174.20			
100	10	172.00			
130	10	166.30			
160	10	120.30			
200	10	176.00			
250	10	147.00			



MODEL

AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	34.65		55.404	0.54776
2	0.5	29.32		24.011	11.098
2.5	0.5	29.25		366.72	52.024
3.2	0.5	27.07		27.677	
4	0.5	23.25			
5	0.5	24.15			
6.3	0.5	25.50			
8	0.5	27.75			
10	0.5	30.00			
13	0.5	31.50			
16	0.5	34.50			
20	0.5	39.75			
25	0.5	45.75			
32	10	63.00			
40	10	72.00			
50	10	82.20			
63	10	89.40			
80	10	103.00			
100	10	120.10			
130	10	129.40			
160	10	120.30			
200	10	100.30			
250	10	88.20			



MODEL

AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	45.05		74.066	0.66372
2	0.5	37.80		24.175	3.5386
2.5	0.5	33.93		102.95	7.4659
3.2	0.5	32.05		63.971	17.323
4	0.5	31.95		170.37	57.416
5	0.5	32.74		119.16	
6.3	0.5	36.71			
8	0.5	41.67			
10	0.5	48.62			
13	0.5	54.67			
16	0.5	58.54			
20	0.5	62.51			
25	0.5	70.45			
32	10	76.70			
40	10	84.30			
50	10	95.00			
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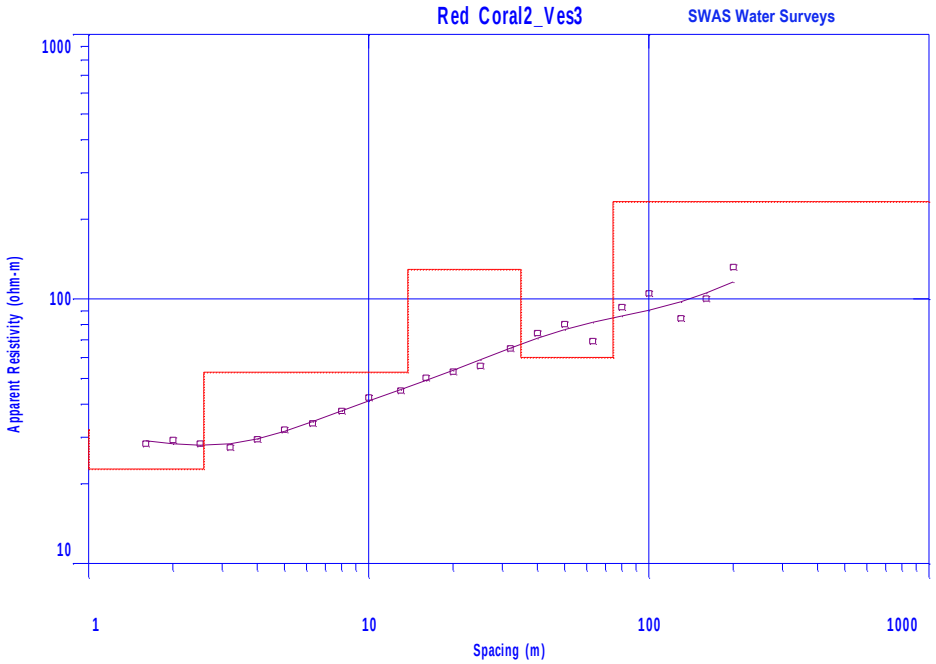
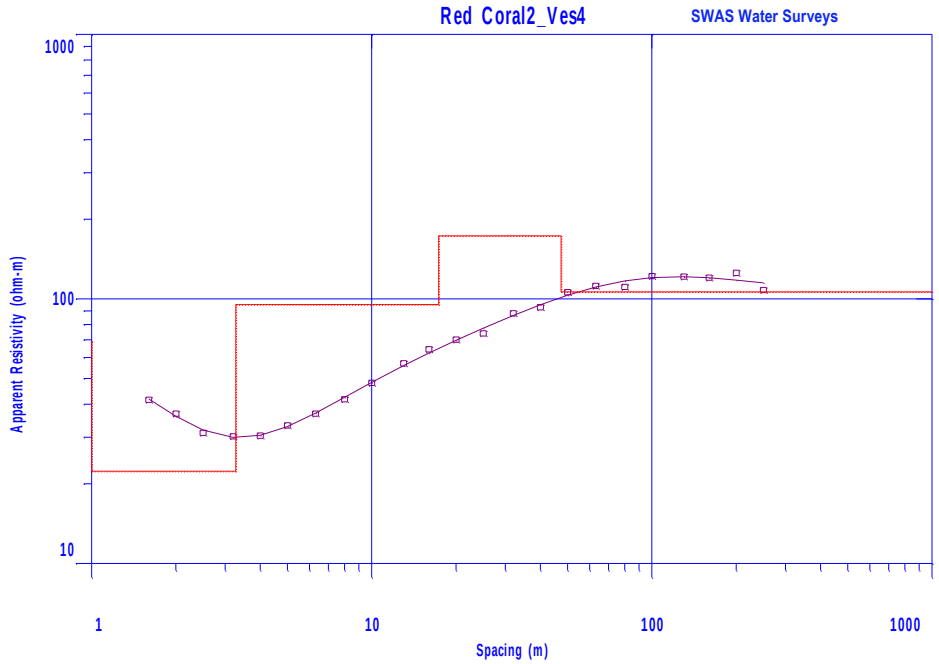


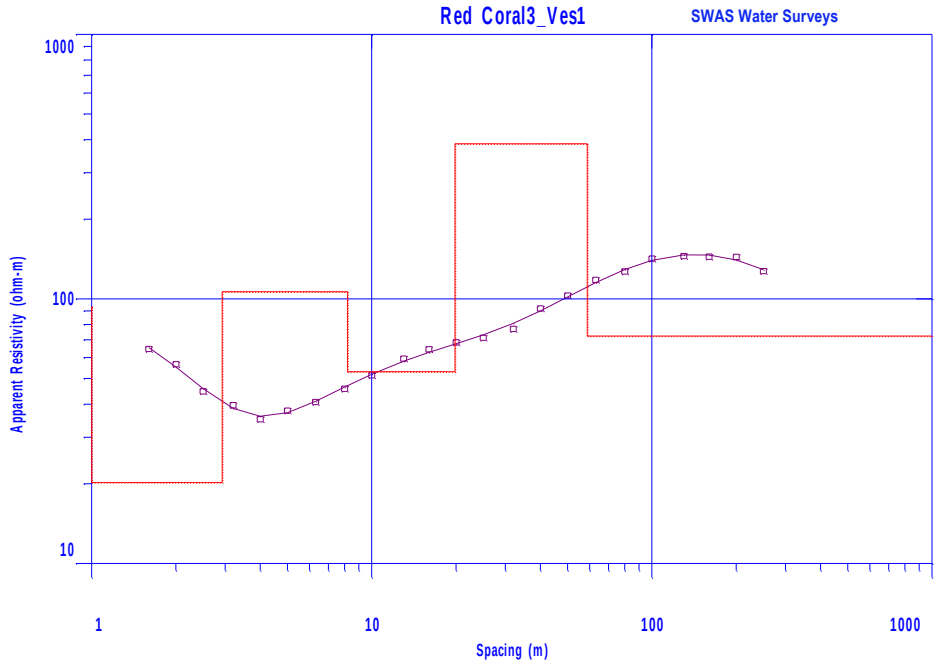
MODEL

AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	28.38		32.001	0.81917
2	0.5	29.30		22.753	2.5775
2.5	0.5	28.38		52.844	13.783
3.2	0.5	27.46		129.30	34.873
4	0.5	29.48		60.082	74.451
5	0.5	32.04		233.32	0.81917
6.3	0.5	33.87		32.001	
8	0.5	37.72			
10	0.5	42.39			
13	0.5	45.04			
16	0.5	50.35			
20	0.5	53.10			
25	0.5	55.85			
32	10	65.00			
40	10	74.30			
50	10	80.30			
63	10	69.30			
80	10	93.10			
100	10	105.00			
130	10	84.50			
160	10	100.30			
200	10	132.00			

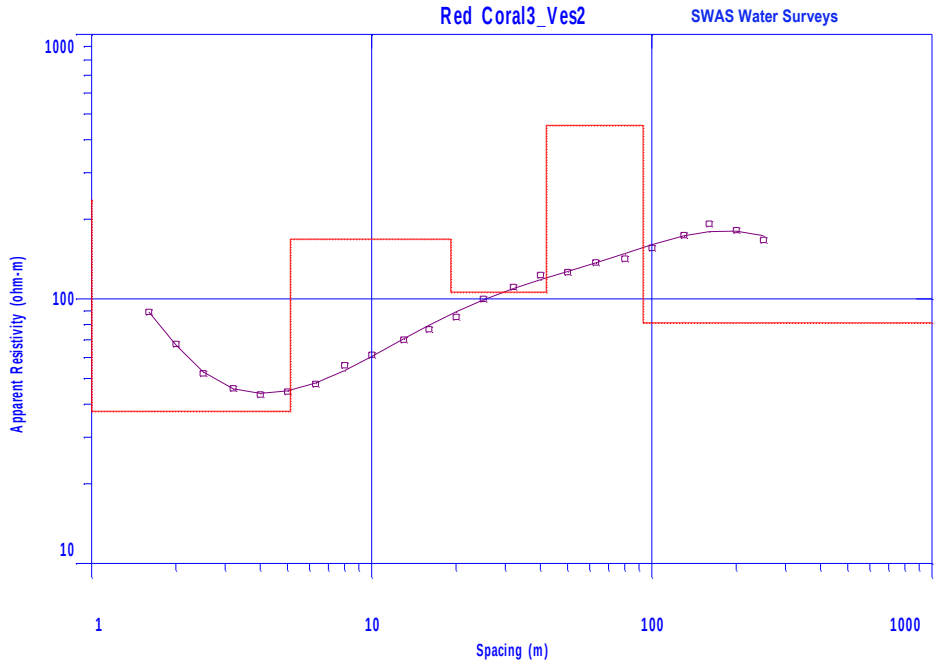


MODEL

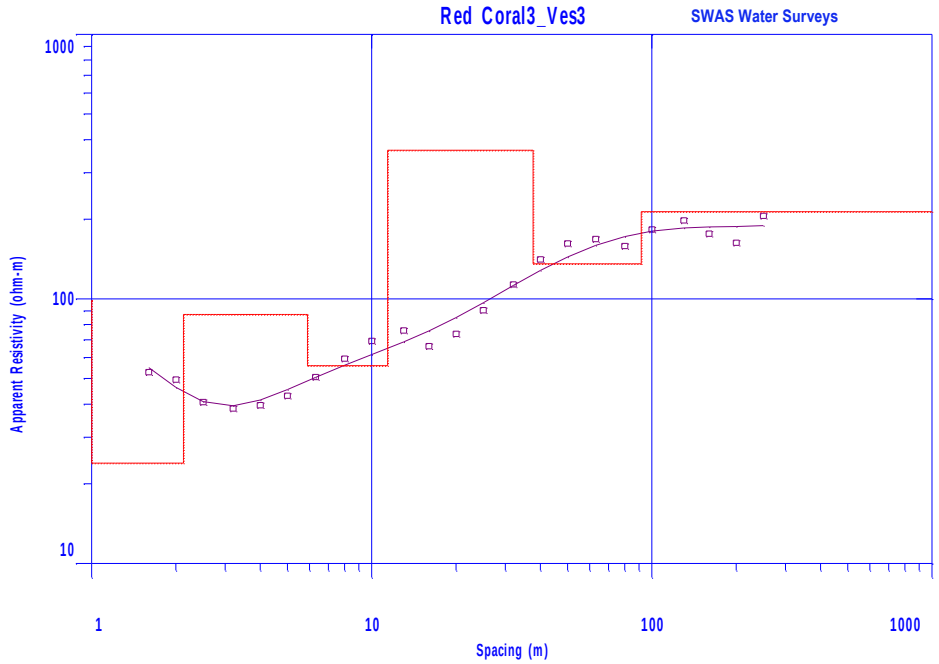
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	41.55		68.832	0.66978
2	0.5	36.83		22.312	3.2704
2.5	0.5	31.16		95.217	17.329
3.2	0.5	30.22		173.11	47.383
4	0.5	30.41		106.29	
5	0.5	33.24			
6.3	0.5	36.83			
8	0.5	41.74			
10	0.5	48.16			
13	0.5	57.04			
16	0.5	64.50			
20	0.5	70.16			
25	0.5	74.04			
32	10	88.20			
40	10	93.00			
50	10	106.00			
63	10	112.00			
80	10	111.00			
100	10	122.00			
130	10	121.40			
160	10	120.30			
200	10	125.40			
250	10	108.00			



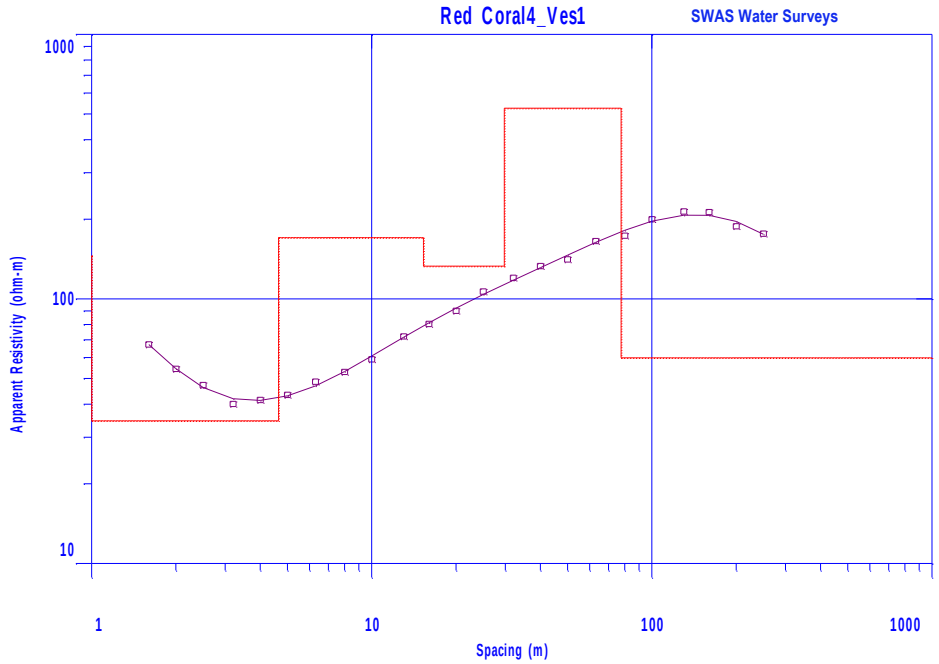
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	64.66		93.022	0.94324
2	0.5	56.62		20.236	2.9259
2.5	0.5	44.73		106.39	8.1894
3.2	0.5	39.63		53.083	19.820
4	0.5	35.10		385.97	58.740
5	0.5	37.82		72.385	
6.3	0.5	40.76			
8	0.5	45.75			
10	0.5	51.41			
13	0.5	59.45			
16	0.5	64.54			
20	0.5	68.51			
25	0.5	71.34			
32	10	77.00			
40	10	92.00			
50	10	103.00			
63	10	118.00			
80	10	127.00			
100	10	142.00			
130	10	145.20			
160	10	144.40			
200	10	144.20			
250	10	127.40			



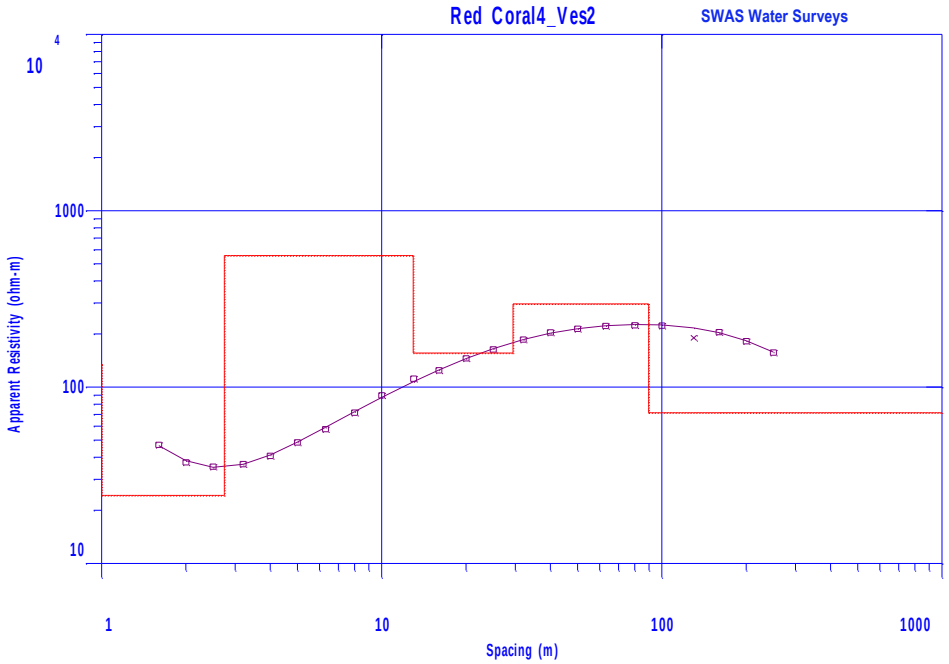
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	89.31		235.99	0.57476
2	0.5	67.62		37.591	5.1218
2.5	0.5	52.31		168.29	19.155
3.2	0.5	45.93		106.00	41.977
4	0.5	43.51		452.98	93.015
5	0.5	44.66		81.185	
6.3	0.5	47.72			
8	0.5	56.14			
10	0.5	61.50			
13	0.5	70.17			
16	0.5	76.81			
20	0.5	85.48			
25	0.5	100.03			
32	10	111.00			
40	10	123.20			
50	10	126.30			
63	10	137.40			
80	10	142.00			
100	10	156.00			
130	10	174.20			
160	10	192.50			
200	10	182.00			
250	10	167.00			



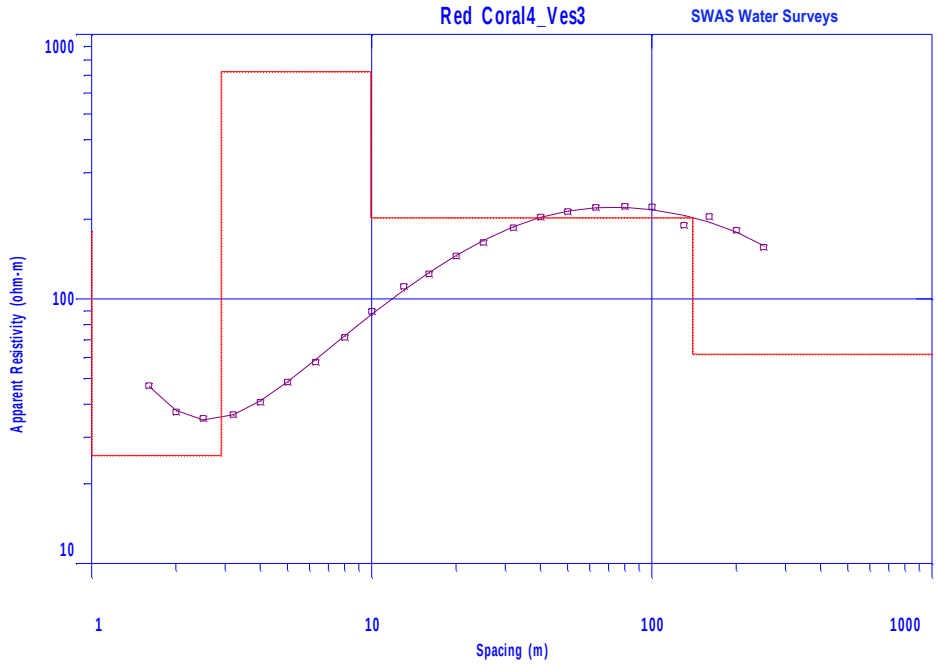
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	52.85		98.492	0.67356
2	0.5	49.54		23.941	2.1285
2.5	0.5	40.74		87.284	5.8956
3.2	0.5	38.53		55.933	11.395
4	0.5	39.63		364.50	37.643
5	0.5	43.05		135.72	91.589
6.3	0.5	50.64		213.78	
8	0.5	59.45			
10	0.5	69.36			
13	0.5	75.97			
16	0.5	66.28			
20	0.5	73.77			
25	0.5	90.61			
32	10	113.40			
40	10	141.00			
50	10	162.00			
63	10	168.40			
80	10	158.40			
100	10	183.00			
130	10	198.00			
160	10	176.40			
200	10	163.00			
250	10	206.00			



AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	67.25		145.37	0.57997
2	0.5	54.38		34.614	4.6468
2.5	0.5	47.22		170.48	15.290
3.2	0.5	40.07		132.92	29.737
4	0.5	41.50		525.97	77.601
5	0.5	43.36		59.831	0.57997
6.3	0.5	48.65		145.37	
8	0.5	52.95			
10	0.5	59.10			
13	0.5	72.12			
16	0.5	80.42			
20	0.5	90.15			
25	0.5	106.61			
32	10	120.20			
40	10	133.10			
50	10	141.00			
63	10	165.40			
80	10	173.30			
100	10	200.00			
130	10	214.00			
160	10	213.00			
200	10	188.10			
250	10	176.40			

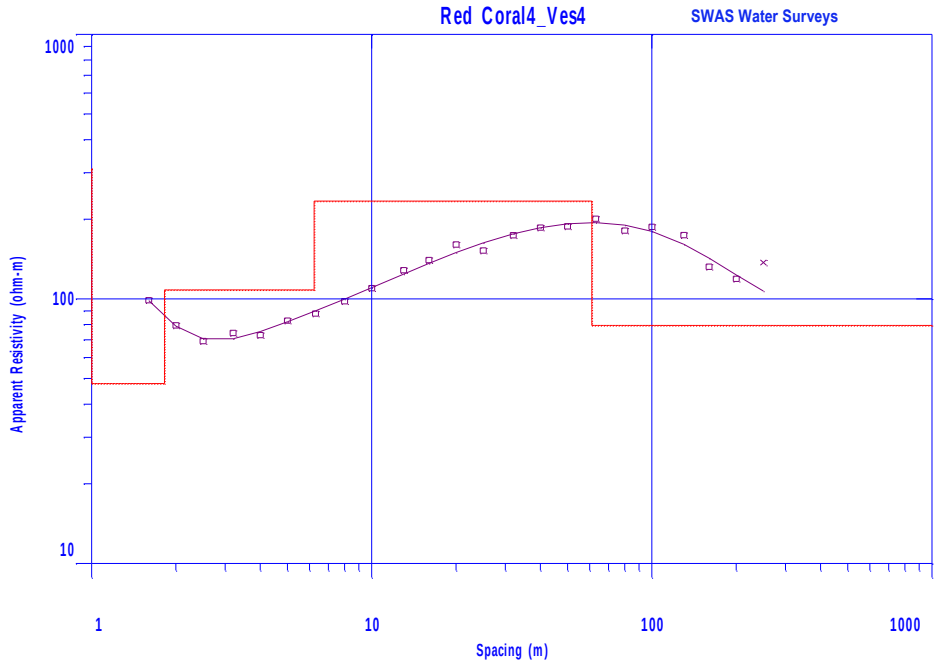


AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	47.03		133.81	0.49648
2	0.5	37.41		24.316	2.7425
2.5	0.5	35.38		557.28	12.956
3.2	0.5	36.56		155.92	29.411
4	0.5	40.73		296.45	89.685
5	0.5	48.53		71.551	
6.3	0.5	57.72			
8	0.5	71.62			
10	0.5	89.79			
13	0.5	111.60			
16	0.5	124.43			
20	0.5	145.49			
25	0.5	163.55			
32	10	186.00			
40	10	204.10			
50	10	214.10			
63	10	222.00			
80	10	224.00			
100	10	223.10			
130	10	190.10			
160	10	205.00			
200	10	182.00			
250	10	157.00			

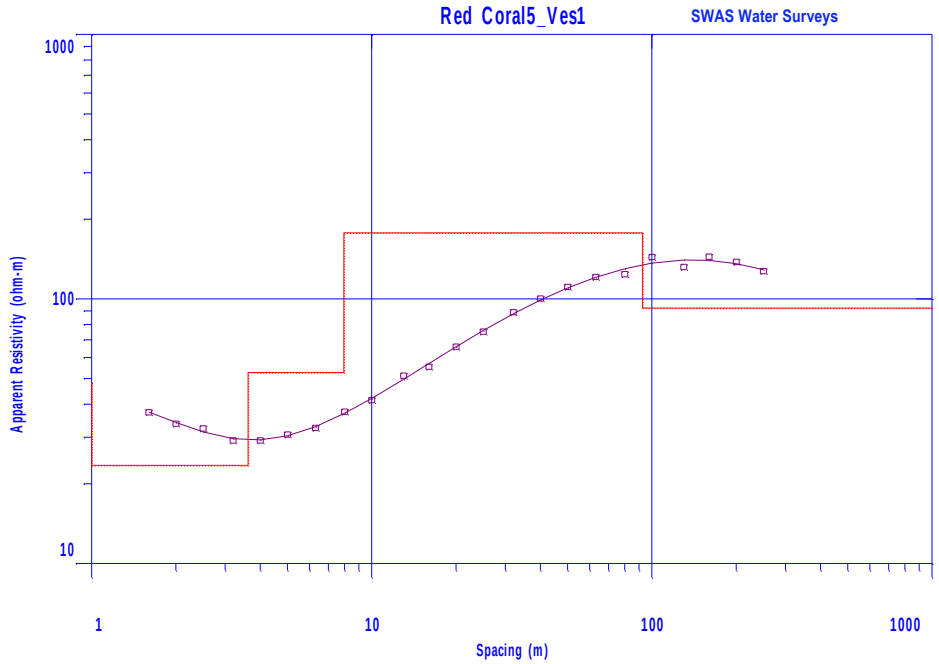


MODEL

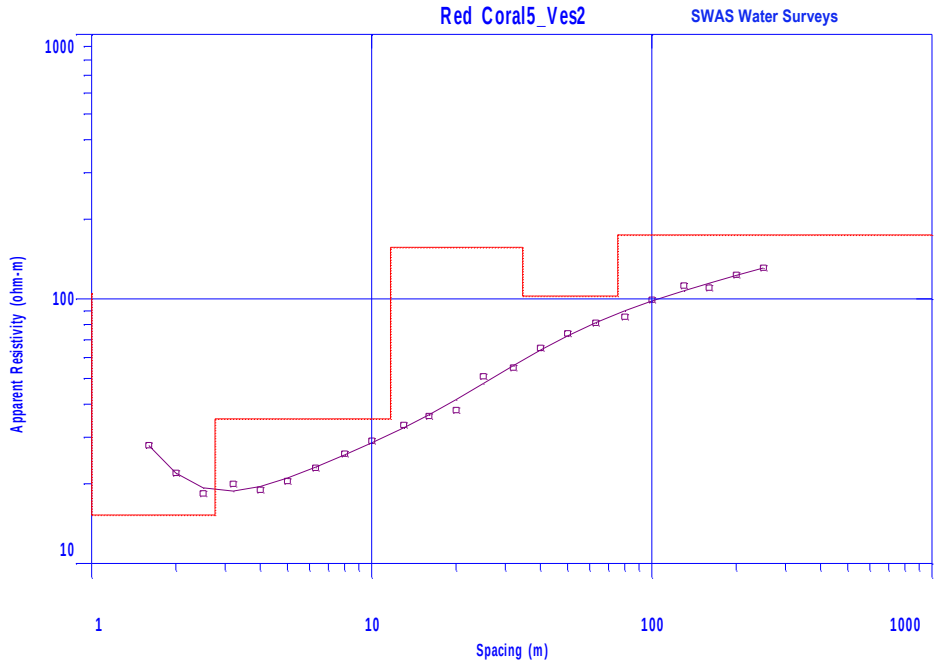
AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	47.03		179.79	0.44572
2	0.5	37.41		25.616	2.8993
2.5	0.5	35.38		722.78	9.9178
3.2	0.5	36.56		202.61	139.79
4	0.5	40.73		61.827	
5	0.5	48.53			
6.3	0.5	57.72			
8	0.5	71.62			
10	0.5	89.79			
13	0.5	111.60			
16	0.5	124.43			
20	0.5	145.49			
25	0.5	163.55			
32	10	186.00			
40	10	204.10			
50	10	214.10			
63	10	222.00			
80	10	224.00			
100	10	223.10			
130	10	190.10			
160	10	205.00			
200	10	182.00			
250	10	157.00			



AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	98.83		309.53	0.49463
2	0.5	79.40		47.854	1.8204
2.5	0.5	69.26		108.17	6.2258
3.2	0.5	74.33		234.16	60.999
4	0.5	72.98		79.386	
5	0.5	82.78			
6.3	0.5	88.01			
8	0.5	97.98			
10	0.5	109.81			
13	0.5	128.39			
16	0.5	140.21			
20	0.5	160.49			
25	0.5	152.38			
32	10	174.00			
40	10	186.00			
50	10	188.00			
63	10	201.00			
80	10	181.20			
100	10	187.20			
130	10	174.20			
160	10	132.30			
200	10	119.13			
250	10	137.20			

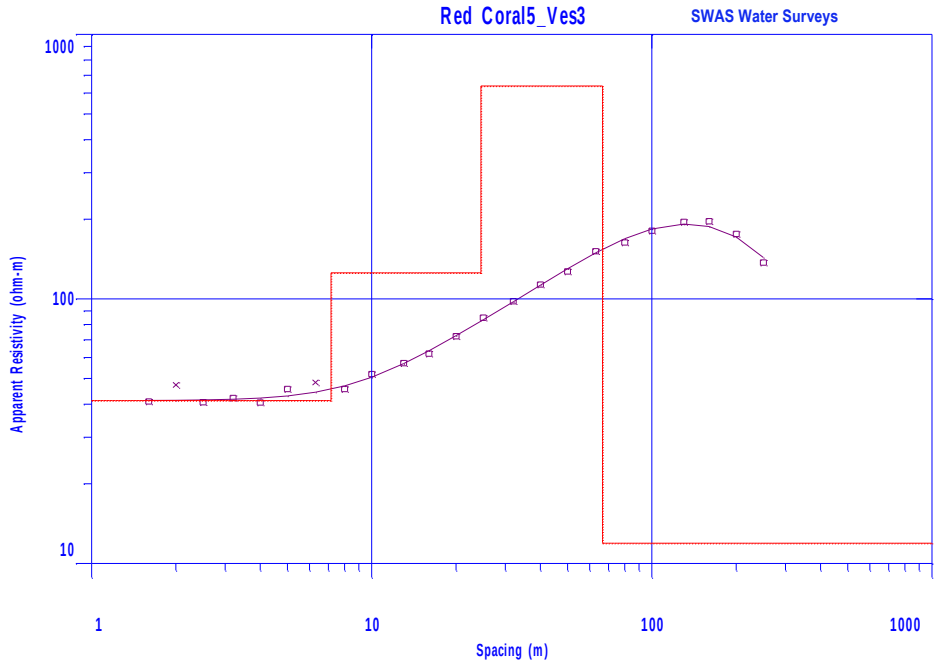


AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	37.29		48.068	0.78654
2	0.5	33.76		23.488	3.6189
2.5	0.5	32.38		52.718	7.9481
3.2	0.5	29.16		177.80	92.490
4	0.5	29.16		92.300	
5	0.5	30.69			
6.3	0.5	32.53			
8	0.5	37.44			
10	0.5	41.43			
13	0.5	51.25			
16	0.5	55.39			
20	0.5	65.98			
25	0.5	75.19			
32	10	89.00			
40	10	100.30			
50	10	111.00			
63	10	121.00			
80	10	124.00			
100	10	144.00			
130	10	132.00			
160	10	144.40			
200	10	138.00			
250	10	127.40			



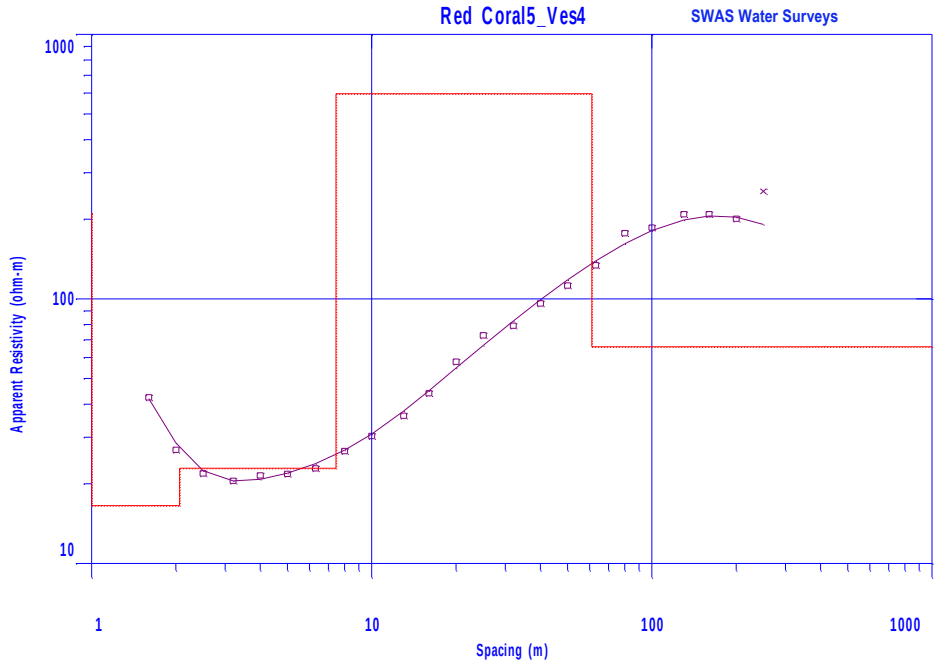
MODEL

AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	28.00		104.77	0.45463
2	0.5	22.00		15.242	2.7584
2.5	0.5	18.40		35.217	11.662
3.2	0.5	20.00		156.72	34.537
4	0.5	19.00		102.54	75.482
5	0.5	20.50		174.57	
6.3	0.5	23.00			
8	0.5	26.00			
10	0.5	29.10			
13	0.5	33.40			
16	0.5	36.10			
20	0.5	38.00			
25	0.5	51.00			
32	10	55.00			
40	10	65.29			
50	10	74.09			
63	10	81.24			
80	10	85.64			
100	10	99.31			
130	10	112.36			
160	10	110.31			
200	10	123.36			
250	10	131.21			



MODEL

AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		Calc. Res (ohm-m)	Depth (m)
1.6	0.5	40.95		41.260	7.1551
2	0.5	47.29		125.53	24.527
2.5	0.5	40.70		638.25	66.680
3.2	0.5	42.22		11.928	
4	0.5	40.57			
5	0.5	45.64			
6.3	0.5	48.30			
8	0.5	45.64			
10	0.5	51.98			
13	0.5	57.18			
16	0.5	62.12			
20	0.5	72.26			
25	0.5	84.94			
32	10	98.00			
40	10	113.30			
50	10	127.00			
63	10	151.40			
80	10	163.40			
100	10	181.00			
130	10	195.40			
160	10	196.50			
200	10	176.00			
250	10	137.20			



AB/2 (m)	MN (m)	App. Resistivity (ohm-m)		MODEL Calc. Res (ohm-m)	Depth (m)
1.6	0.5	42.44		209.84	0.47034
2	0.5	26.89		16.545	2.0605
2.5	0.5	21.90		22.893	7.4513
3.2	0.5	20.53		596.30	61.051
4	0.5	21.51		65.943	
5	0.5	21.80			
6.3	0.5	22.88			
8	0.5	26.60			
10	0.5	30.31			
13	0.5	36.18			
16	0.5	44.00			
20	0.5	57.88			
25	0.5	72.84			
32	10	79.20			
40	10	96.10			
50	10	112.30			
63	10	134.00			
80	10	177.20			
100	10	186.00			
130	10	209.00			
160	10	209.00			
200	10	201.00			
250	10	255.00			

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