

**ENVIRONMENTAL & SOCIAL IMPACTS ASSESSMENT STUDY REPORT;
PROPOSED HOUSING DEVELOPMENT ON PLOT NO. MN/III/3237 AT
MSUMARINI BEACH, KIKAMBALA, KILIFI COUNTY, KENYA**

Prepared for:
Bestbase Investment Ltd
P.O BOX 81911-80100
MOMBASA



GPS coordinates: 3°51'42" S, 39°48'34" E; 3°51'39" S, 39°48'35" E; 3°51'45" S, 39°48'40" E & 3°51'42" S, 39°48'41" E

Prepared by:
Munyua A. Mwenga &
Fred Aronya

P.O Box 34075 - 80118
Mombasa, Kenya
+254 722313180
mwenga@gmail.com

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ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT STUDY REPORT

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FACT SHEET

Project Name	Sandy Shores Apartments
Lead implementing entity	Bestbase Investment Ltd
Report	Environmental and Social Impact Assessment Study Report
Project components	<ol style="list-style-type: none"> 1. 184 mixed housing units (1bedroom, 2bedrooms,3 bedrooms + 3 bedrooms +DSQ) 2. Car parking- 160 spaces 3. Recreational facilities- Club house, Playgrounds
Project Cost	Ksh.3,909,000,000
Project site	<p>Plot no MN/III/3237, Msumarini Beach, Kilifi County</p> <p>2.229 hectares</p>

NEMA Report Submission Details

Completed by:

Signed: _____

Signed: _____

Date: _____

Date: _____

Munyua A. Mwenga
LEAD EXPERT NEMA REG.NO 0340

Fred Aronya
LEAD EXPERT NEMA REG.NO 0668

PROPONENT

Signed:..... Date:

Disclaimer:

This Environmental Impact Assessment Study Report is based on literature review, preliminary feasibility and design reports and findings from field assessment. It is strictly confidential and any materials thereof should strictly be used in accordance with agreement from the management of Bestbase Investment Ltd. It is however, subject to conditions in the Environmental Management and Coordination Act 1999, Environmental (Impact Assessment and Audit) Regulations, 2003

Executive Summary

This study documents the outcome of the environmental and social impact assessment carried out on a proposed multi storey housing development of 184 units to be developed on Msumarini beach, Kikambala. The project is to developed by Bestbase Investment Limited on plot number MN/III/3237: a 2.229 hectares' piece of beach property.

The assessment was conducted by a cross-disciplinary team encompassing: environmentalists, urban planner & social scientist. The study team also tapped into the local knowledge of the communities within the project area through structured questionnaire survey, informal interviews and chiefs barazas.

The project area is bound by the following GPS co-ordinates: 3°51'42" S, 39°48'34" E; 3°51'39" S, 39°48'35" E; 3°51'45" S, 39°48'40" E & 3°51'42" S, 39°48'41" E

Summary of relevant legislation with a bearing on the proposed housing project.

Legislation & regulations	Status/Remark
1. EMCA 1999	<ul style="list-style-type: none"> - ToR for ESIA submitted & approved- Annex 1 - ESIA report submitted - PP2 form & approved drawings attached- Annex 4 - Hydrogeological report complete Annex 8 - Pending approval of ESIA - Project Design incorporates 8 solar water heaters per block - NCA awaiting ESIA licencing
2. Wetlands, River Banks, Lake Shores and Sea Shore Management Regulations (Legal Notice No 19 of 2009)	
3. Physical & Land Planning Act 2019	
4. County Government Act 2012	
5. Noise & Excessing vibration pollution control regulations	
6. Public Health Act Cap 242	
7. EMC (Waste Management) Regulations, 2006	
8. Water Act 2016	
9. Water Rules 2007	
10. OSH 2007	
11. Energy Act 2019	
12. Wildlife Act	
13. Forest Act 2005	
14. National Construction Authority	

Summary of key negative impacts from the proposed housing project and proposed safeguards:

Concerns	Mitigation measures
Beach encroachment	<ol style="list-style-type: none"> 1. Prohibition of cutting and or removal of vegetation or any dry plant matter from the riparian vegetation 2. No construction within the range of 60 meters from the high watermark 3. Prohibition of removal of soil or organic manure from the riparian vegetation zone; 4. Prohibition of introduction of alien species or planting of exotic vegetation within the riparian zone
Water pollution	<ol style="list-style-type: none"> 5. Incorporation of bio digester system for effluent preprocessing 6. Regular maintenance of the effluent treatment system 7. Timely exhausting of sludge from the WWTP 8. Obtain effluent discharge license
Solid waste Pollution	<ol style="list-style-type: none"> 9. Provision of labeled & color coded waste bins across all housing units 10. Encourage sorting of waste at source

Concerns	Mitigation measures
	11. Regular removal of waste from the site by waste contractor 12. Use of licenced waste contractors 13. Regular beach clean ups 14. Signage on responsible waste disposal
Dust nuisance	15. Sprinkling of water on access road & surfaces to suppress dust 16. Paving of road to eliminate dust during operational phase 17. Use of dust screens during construction 18. Provision of PPE to workers working in dust areas
Noise nuisance	19. Noise level to be within the prescribed legal limits 20. All construction works to be limited to daylight hours 21. Notification in writing to immediate neighbors for noisy activities 22. Obtaining of noise permit for anticipated persistent noisy activity. 23. Provision of adequate PPE for workers in noisy sections
Occupational health & safety concerns	24. Continuous dust & noise monitoring at construction site 25. Provision of appropriate PPE for workers 26. Robust safety awareness & supervision at workplace
Spike in demand for public utilities	27. Installation of water conservation fixtures 28. Waterharvesting 29. Reuse of water from WWTP for landscaping & flushing toilets 30. Adequate water reservoirs for the development 31. Sinking of borehole to supplement water needs 32. In cooperation of renewable energy sources

Based on the public consultation conducted in the study area, the public identified the main concerns:

1. Transparent mechanisms for prioritisation of locals in employment opportunities for skilled & unskilled labour.
2. Beach access for fishermen & general public.
3. Health and safety at project site.
4. Dust management from the use of access roads.
5. Development of a formal road access to the project site.
6. Fresh water demand by the project.

To address the above the following resolutions were reached in the consultative forums:

1. Committee to be formed spearheaded by office of the MCA – Mtepeni ward to liaise with project management team on employment issues as well as dispute resolutions with respect to the social management plan.
2. The official road would be graded, murramed, watered & paved to improve access & reduce dust generation during the project cycle.
3. Existing beach access close to the project would be cleared and levelled to provide access to the Msumarini beach.
4. Turtle breeding sites would be conserved.

5. Water demand would be supplemented by on-site boreholes.
6. A football pitch would be developed at the public learning institution to nurture local talent.
7. Msumarini secondary school laboratory would be equipped, while the adjacent primary school would receive textbooks for learners.

Environment & Social Management Plan.

The EMP's developed for the proposed project will ensure that environmental pollution and or degradation does not occur as a result of implementation and operation of any of the components of the proposed development. The ESMP's cover the following management plans among others:

1. Beach management plan.
2. Solid waste management plan.
3. Sewage management plan.
4. Noise management plan.
5. Dust management plan.
6. Occupational Hazards Management Plan.

The project proponent and contractor will need to undertake the following to ensure the success of the ESMP;

1. Develop and document environmental management policies that will guide construction work and other site operations during and after implementation of the project. These policies should address environmental conservation measures to be put in place, occupation health & safety and handling of waste generated by the project.
2. The project proponent to avail required finances for implementation of the ESMP and ensure adherence to the ESMP's by the contractors implementing the project.
3. The project contractors to adhere to the environmental management plan

Environmental Monitoring Plan

This plan provides for both active and reactive monitoring of various environmental parameters including;

1. Monitoring of the achievements of specific plans of the Environmental Management Plan, performance criteria and fulfilment of objectives.
2. Systematic inspection of work place.
3. Surveillance and monitoring of the work environment, including the organization of work and activities involved.
4. Monitoring of workers' health.
5. Monitoring of compliance with laws, regulations and requirements.
6. Environmental conservation and related activities in the area.
7. Work related injuries, ill health (including record keeping and monitoring of sickness/absence), disease and accidents.
8. Efficient safety and health performance.

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Herd of goats on project site

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ABBREVIATIONS

Abbr./Symb.	Term
amsl	above mean sea level
GIS	Geophysical Information System
GoK	Government of Kenya
EMCA	Environmental Management & Coordination Act
EMP	Environmental Management Plan
ESIA	Environmental & Social Impacts Assessment
KMFRI	Kenya Marine & Fisheries Research Institute
KFS	Kenya Forest Service
Km	Kilometres
m	Meters
CGK	County Government of Kilifi
NEMA	National Environmental Management Authority
NLC	National Land Commission
WRA	Water Resources Authority (WRA)
ToR	Terms of Reference
WWTP	Wastewater Treatment Plant
LPG	Liquified Petroleum Gas
PHO	Public Health Officer
CDE	County Director of Environment
EHS	Environment Health & Safety
DMP	Dust Management Plan
PPE	Personal Protective Equipment
NMP	Noise Management Plan
OHMP	Occupational Hazard Management Plan
VMP	Vegetation Management Plan
KFS	Kenya Forest Service

1. Background to the Project

1.1 Introduction

This ESIA report documents the outcome of a multidisciplinary environmental assessment study conducted for Bestbase Investment Ltd. Bestbase Investment Ltd “the proponent” proposes the development of a gated community housing in 12 blocks. Under the classification of projects in the Environmental Management and Coordination Act (EMCA) of 1999, for the purposes of Environmental Impact Assessment/Audit (EIA/EA), the proposed project falls under the second schedule, category 2 - Urban Development. Environmental concerns now need to be part of the planning and development process and not an afterthought, it is therefore advisable to avoid land use conflicts with the surrounding area. To avoid unnecessary conflicts that retard development in the country, the proponent undertook this ESIA and incorporated environmental concerns. Finally, a comprehensive Environmental Management is mandatory for a project of this magnitude and nature due to its close proximity to the Indian Ocean.

1.2 Project Proponent

The project proponent is Bestbase Investment Limited, a locally incorporated Limited Company. Annex 3 gives certificate of incorporation and PIN certificate. Bestbase Investment limited owns the land for the proposed development. The land is approximately 2.229 Hectares and is registered at the National Land registry; Registration Section No. Mainland North/III and the Title Number MN/III/3237. Annex 2 shows the land documents for the project site.

1.3 Study area Location

The proposed site is located in Vipingo beach in Kikambala area of Kilifi North Constituency; it is approximately 1.8 kilometers off Mombasa-Malindi Highway. It is 7.63 Km to the famous Vipingo Ridge and about 5.23 Kilometers to the Kikambala shopping centre. The site covers an area of 2.229 hectares. The area has a growing commercial and residential unit. The area's elevation ranges 0-10 meters above Sea Level. The area is fronting the Indian Ocean shores. The area is approximately 28 kilometers to the Central Business District (CBD) of Mombasa, and approximately 12 kilometers to the Mtwapa Shopping Centre at the border of Kilifi and Mombasa.

1.4 Objectives of the study

The goal of the environmental assessment was to inject sustainability into the proposed housing development. The ESIA study was guided by the following specific objectives:

1. To develop a robust baseline for predicting impacts and future monitoring.
2. To incorporate public input in the project planning process.
3. To develop an ESMP for mitigation of key adverse impacts of the housing development.

1.5 Terms of Reference

In accordance with the terms of reference, the following was the scope for this ESIA:

- a) Clear description of the physical location and linkages of the project including the baseline conditions of the project area.
 - b) A description of the project characteristics including project objectives, project design, activities, technology, procedures and processes, materials to be used, products, by-products and waste generated, during the project construction, operation and de-commissioning phases.
-

- c) A description of the national environmental legislative and regulatory framework, baseline information and any other relevant information related to the project.
- d) Description of the recipient environment (baseline environment and social setting of the project area and the marine environment.
- e) The potential environmental effect of the project, including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- f) Project alternative analysis including locations, technologies or process available, analysis of alternatives, and reasons for preferring the proposed option.
- g) An environmental management and monitoring plan outlaying the activities, associated impacts, mitigation measures, monitoring indicators, implementation timeframes, responsibilities, and cost.
- h) An action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities other development projects.
- i) Measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.
- j) Conclusions, recommendations and identification of gaps and uncertainties which were encountered in compiling the report.

A copy of the approved ToRs report is attached in Annex 1

1.6 Methodology

The assessment was carried out using the following methods;

- a) Review of project documents such as the architectural drawings, site plan, land and structural documents.
- b) Field visit to familiarize with the proposed site conditions and assess neighbouring activities.
- c) Interviews with some neighbours to seek their comments with regard to the proposed project.
- d) Holding a public baraza in conjunction with local provincial administration.
- e) Review of relevant literature related to a project of such magnitude.
- f) Experts knowledge.

Figure 1: Location of proposed housing development



2. Environmental Conditions

2.1 Introduction

This section discusses baseline information of the study area in covering, climate, hydrology, geology, soils, land use, water supply and population.

2.6 Environmental Baseline

2.6.2 Climate

The proposed project site located on the Kenyan coastline has a moist, tropical and monsoon Climate. Temperatures are generally high throughout the year with maximum temperatures ranging between 26.5-34 and minimum temperatures ranging between 22.5-24.5. Total sunshine hours are never less than 6 hours per day and exceed 8 hours from October to March every year. Winds follow a typical monsoon pattern; during December to February they blow from the east and east-north east. By March they start to shift towards the south and by April, at the start of the monsoon seasons they are predominantly from south-southwest. The predominant wind direction continues to be from the south from May until October with gradual eastwards shift beginning which becomes more pronounced by November and by December the cycle begins again. Coastal annual rainfall ranges from 300mm in the hinterland to 1,300mm at the coastline. Areas recording the highest rainfall are Mtwapa and Arabuko Sokoke forest. Evaporation ranges from 1800mm along the coastal strip to 2200 mm in the hinterland. Evaporation rates are highest during the months of January to March. The climate is hot and wet in Kikambala area.

2.4 Project site characteristics

The section of the project area that fronts the high water mark and it is covered by sand has an area of 0.425 Hectares. It has an approximate length of 126 meters and a width of 41 meters from the high water mark. The area is one of the lowest point in the area since it fronts the ocean which is 0 meters below sea level. The elevation is generally between 1-10 meters.

2.4.1 Flora & Fauna

Some of the plant species the study identified on the proposed project site include *Azadirachta indica* (Mwarubaini), *Lantana camara*, *Lantana trifolia* (mvepe), *Kigelia Africana* (Myaya), *Pandanus kirkii* (Mkadi), *Cocos nucifera* (coconut) among others. It is important to note that the vegetation species mentioned above are scantily located within the proposed project site. Plates 3, 4, 5 and 6 below shows condition of vegetation found on the proposed project site.

The project site has a 138 meter beach front. Coastal zones are made up of several different ecosystems each with a high degree of fauna and flora diversity. The ecosystems include coral reefs, mangroves, tidal and estuarine ecosystems. The coral reef runs parallel to the coast at distances ranging from 500m- 2 km from the shoreline. There are ten main coral reefs along the Kenyan coast of which Bamburi reef, Vipingo-Kanamai reef and Watamu-Malindi reefs are found along the shores of Kilifi County.

The coral reefs are one of the examples of biologically productive and taxonomically diverse ecosystems. About 140 species of soft and hard corals have been identified along the Kenyan coast. They are very important in that they form breeding grounds for various marine fauna, they serve as a barrier against the force of the sea and the lagoons they protect provide stable environments for breeding and feeding of marine biota.



2.5 Geology

2.5.1 Regional Geology

The geology of Kenya's coastal strip was determined by the rifting and break-up of the palaeozoic Gondwana continent. Jurassic rifting of a Permo-Triassic basin filled with terrestrial clastic material into a pre-marine basin on the eastern edge of the African plate. These characteristics are generically the same as Southern Africa's Karoo sediments. Reworking and uplift led to the deposition of marine and peri-marine sediments, culmination in an erosive hiatus from Cretaceous to mid-Neogene times (the Pliocene). Fresh uplift led to the deposition of fluvial pebble beds, gravels and sands of the Magarini/Kilindini formation on older competent sediments. At Pleistocene times, sea level changes led to transgressions and regressions, leaving behind raised sands and fossil coral limestones (Horkel et al., 1984). Consequently, the hydrogeology of corals is characterised by good interconnectivity of pores which subsequently result into good permeability hence poor fair discharge & recharge of the aquifers in this region.

2.5.2 Local geology

Locally, Caswell and Baker, (1953) shows that the site lays on coral and coral breccia formation. The water bearing formation is expected within the fractured and weathered zones of the sandy coral reef. The figures below show some of the eroded coral reef as well as exposed coral limestone on the project site. This formation makes quarrying a commercial activity within the area. Additional details on site specific geology were established through a geotechnical investigation whose findings form annex 11.



Figure 2: Eroded Coral reef

2.7 Socio- Economic Baseline

2.7.1 Land tenure & Use

The proposed project site MN/III/3237 is located on the Msumarini beachfront with lease hold land. The lease is for 99 years starting from 1986. Neighboring the project site is Kijipwa settlement scheme established in the 1982 and covering 1,600 acres' freehold tenure. The settlement scheme is among the 70 settlement schemes in Kilifi County targeted at resolving landlessness in the county. The scheme had 350 plots measuring 1.0 hectares at the start. Eight parcels of land in the settlement scheme are under investigation by the National Land Commission (NLC) for skewed allocation and inadequate local involvement. A public hearing was conducted by the National Land Commission (NLC) in April 2018 to resolve the dispute. A section of Msumarini primary school land straddles some of this land disputes.

2.7.1 Residential Land Use

The land use in the area is predominantly residential. There are various housing typologies that have been developed in the area. There are traditional housing typologies on the Kijipwa scheme section of the area, gated apartments such as Sultan Apartment 2.7 Km and Aqua Villas 509 Meters which have similar proposals to the project.

2.7.2 Commercial Land Use

In the project environ, there are various commercial buildings such as Paradise Resort (not operational at the time of the study), the nearest commercial centre is Kikambala- Majengo 5 Km from the project and 12 Km from Mtwapa town.

2.7.3 Industrial Land Use

About 1 Km from the project is a quarry that is currently used by the Bamburi cement.

2.7.5 Education Land Use

There are schools in the area which include; 750 meters from the project is the Msumarini Primary School, 989 meters is the Msumarini Secondary School and Alibaba Primary School.

2.7.4 Agricultural Land Use

There are various agricultural activities in the area which includes subsistence farming, beef & dairy husbandry, Amkeni Poultry Farm among other in the Kijipwa scheme section.



Herd of goats on project site

Figure 4: Cattle herd in the background Kijipwa limestone quarry

Figure 3:

2.7.6 Transportation Land Use

The main linkage to the area is B8 road, Mombasa-Malindi road which about 1.8 Km, other minor access roads are made of muram roads. There is Kijipwa airstrip located approximately 1.8 Km from the project.



Figure 5: Current access road to the project site



Figure 6: Aqua Villas

2.7.7 Forest Reserve

There is a forest that came about as a result of reclamation of the quarry sites within the area. These quarries have been reclaimed and trees planted giving rise to a large forest.

2.7.8 Public Purpose

Like the rest of the country, the area is religious with both Christians and Muslims being the predominant religions. There are various mosques and churches in the area.

2.8 Water supply & Demand situation

Within Kikambala, piped water is supplied by KIMAWASCO. This supply is intermittent. The local community relies on drilled boreholes which produce saline water. The project proponent has already connected to the water KIMAWASCO supply. Owing to the unreliable nature of this supply as well as the water demand by the project, Bestbase Investment limited will supplement water supply with borehole water. Most of the water from the wells and boreholes in the proposed project area is either mineralized or saline. A hydrological report in annex 8 is preparatory to this process.



Figure 7 Pipe water infrastructure at Msumarini & metered connection to project site

3. PROJECT DESCRIPTION & DESIGN

The proponent proposes to put up 184 housing units in a gated community setup on a beach plot of land measuring 2.229 hectares. The entire project covers an area of land measuring approximately 13,310 m², translating to a ground coverage of 58%. The project design proposes modernized and scenic residential building and recreational facilities that will properly accommodate and blend with the environment of Msumarini beach. The housing units will have various amenities including: 160 car park spaces; swimming pools, Infinity pool, basketball ground, football pitch and rock climbing. The developer proposes to use a bio digester for the waste management in the area. The 184 units will be built in 6 thematic clusters described below:

3.1 Pearl Oyster

The proposed building units have a total of 9 floors with a height of 33 Meters.

3.2 Coral Ridge

The proposed building units in this section have a total of 4 floors with a height of 15 meters.

3.3 Sea Shell

The proposed building units in this section have a total of 10 floors with a height of 33 meters.

3.4 Star Fish

The proposed building units in this section have a total of 4 floors with a height of 15 meters.

3.5 Turtle Cay

This housing block will have a total of 4 floors with a height of 15 meters.

3.6 Seagull nest

This housing block will have a total of 4 floors with a height of 15 meters.



Figure 8 Architectural rendering of Pearl Oyster & Sea Shell apartment blocks



Figure 9 Plan view of the proposed housing development

The proponent has already built a show house on site as shown in the photo below:



Figure 10 Completed show house/ site office at the project site



Figure 11 Rendering of Seagull & Starfish housing blocks

A summary of the various housing typologies to be developed in the gate community is summarized in the table 1-1 below.

Table 1 Summary of housing apartments units spaces & parking allocation

No.	Estate Section	No. of bedrooms	Area (Square feet)	No. of Units	No. of Car Parks
1	Sea Shell A	1 & 2	800 & 1100	36	16
2	Sea Shell B	1 & 2	800 & 1100	32	16
3	Sea Shell C	1 & 2	800 & 1100	32	16
4	Pearl Oysters A	2&3	1240 &1600	14	16
5	Pearl Oysters B	2&3	1240 &1600	14	16
6	Star Fish A	1	1000	8	8
7	Star Fish B	1	1000	8	8
8	Seagulls Nest A	3 +DSQ	1865	8	16
9	Seagulls Nest B	3 +DSQ	1865	8	16
10	Coral Ridge A	1 & 2	1000 & 1250	8	8
11	Coral Ridge B	1 & 2	1000 & 1250	8	8
12	Turtle Cay	T.C		8	16
	Total (32,810m ²)			184	160

3.6 Project Estimated Cost

The final project cost estimate the total project cost for the housing development to be Ksh.3,909,000,000 (**Kenya Shillings Three billion nine hundred & nine million**).

4. POLICY & LEGAL FRAMEWORK

4.1 Policy Framework

4.1.1 Environmental policy

Sessional Paper No. 6 of 1999 on Environment and Development, since adoption by parliament in 1999 has been in use and had influenced the formation of EMCA (amended) 2015, but has since been surpassed by time and is therefore under revision to comprehensively cover areas that were previously left out to augment it.

The revised draft of the National Environmental Policy, dated April 2012, sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources, and recognizes that natural systems are under intense pressure from human activities particularly for critical ecosystems including forests, grasslands and arid and semi-arid lands. (National Environmental Policy, 2012). The objectives of the Policy include developing an integrated approach to Environmental Management, strengthening the Legal and Institutional Framework for Effective Coordination, Promoting Environmental Management Tools.

Relevance

The project shall implement the EMSP to mitigate the impacts resulting during the construction and operational phases of the project; this will ensure that the natural environments are not destabilized by the subsequent project activities.

4.1.2 Land policy

In chapter 2, land policy is linked to constitutional reforms; regulation of property rights is vested in the government by the Constitution with powers to regulate how private land is used in order to protect the public interest. The Government exercises these powers through compulsory acquisition and development control. Compulsory acquisition is the power of the state to take over land owned privately for a public purpose. However, the Government must make prompt payment of compensation. (National Land policy, 2009)

Chapter 4 of the land policy under Environmental Management Principles, The National Land Policy provides for the policy actions for addressing the environmental problems such as the degradation of natural resources, soil erosion, and pollution. (National Land policy, 2009)

For the management of the urban environment it provides guidelines to prohibit the discharge of untreated waste into water sources by industries and local authorities; it also recommends for appropriate waste management systems and procedures, including waste and waste water treatment, reuse and recycling. The policy goes further to advocate for environmental assessment and audit as a land management tool to ensure environmental impact assessments and audits are carried out on all land developments that may degrade the environment and take appropriate actions. Public participation has been indicated as key in the monitoring and protection of the environment. (National Land policy, 2009)

Chapter 4 further advocates for the Implementation of the polluter pays principle which ensures that polluters meet the cost of cleaning up the pollution they cause, and encourage industries to use cleaner production technologies. (National Land policy, 2009)

Chapter 6 under land issues requiring special intervention asserts that “Land rights of minority communities shall be protected through a law to be passed specifically to secure their rights as individuals and groups and recognition of their resource management systems to ensure sustainability.” It further states that, “Land rights of vulnerable groups (namely subsistence farmers, pastoralists, hunters and gatherers, agricultural labourers, unskilled workers, unemployed youth, persons with disabilities, persons living with HIV and AIDS, orphans, slum and street dwellers and the aged) shall be addressed by creating a system for identifying, monitoring and assessment, resettling them, facilitating their participation in decision making over land and land based resources, and protecting their land rights”. (National Land policy, 2009)

Relevance

Sandy Shores Apartment management shall implement the ESMP to ensure that the environment around the proposed site is not polluted by subsequent activities during construction and operational phases. Health and safety measures will have to be maintained to protect users and workers during construction and operational phases.

4.1.3 Kenya Vision 2030

Kenya Vision 2030 is the country’s long term development blueprint guiding development in Kenya from 2008 to 2030. Its objective is to transform Kenya into a newly industrializing, “middle income country providing a high quality life to all its citizens by the year 2030”

Section 5.4 on the Environment, states that Kenya aims to be a nation living in a clean, secure and sustainable environment by 2030. It also states that Kenya will harmonize environment-related laws for better environmental planning and governance. (Kenya Vision 2030, 2007)

Relevance

As part of environmental protection, mitigation measures have been formulated for this project which will ensure minimal negative effects to the environment. Development of the housing development is in line with the national vision of providing a high quality of life for all its citizens.

4.1.4 National environmental policy 2013

The goal of this Policy is to Better quality of life for present and future generations through sustainable management and use of the environment and natural resources. (National Environmental Policy, 2013)

Relevance

The EIA report, as one of the project’s management tool, has developed an ESMP for the study on how to handle wastes from the development to ensure environment is not compromised by illegal dumping of wastes.

4.2 Legislative Framework

The Legislative frameworks relevant to the project are discussed below;

4.2.1 The Constitution of Kenya

In the Constitution of Kenya, 2010 Part II (Environment and Natural Resources), (I) the State shall:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits.
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya.
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.
- Encourage public participation in the management, protection and conservation of the environment.
- Protect genetic resources and biological diversity.
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment.
- Eliminate processes and activities that are likely to endanger the environment.
- Utilize the environment and natural resources for the benefit of the people of Kenya.

(II) "Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Chapter 5 on Land and Environment emphasizes:

- Land use and management shall by law benefit local communities.
 - Community land is protected from encroachment by State.
 - Law shall protect Rivers, forests and water bodies.
 - Equitable access to land.
 - All lawful land rights are secured; only someone who has stolen land needs to worry.
 - County governments will manage land in trust of the people in accordance with the Constitution.
- (The Constitution of Kenya, 2010)

Relevance

The Constitution of Kenya champions for sound management and sustainable development of all Kenyan projects, both public and private investments. It also calls for the duty given to the project proponent, to cooperate with State organs and other persons to protect and conserve the environment as mentioned in Part II. The project proponent will ensure that trees, grass and other plants are planted as a measure of environmental conservation.

4.2.2 The Environment Management and Coordination Act (Amended), 2015

The Environment Management and Coordination Act (Amended), 2015 provides for the establishment of an umbrella Legal and Institutional Framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Section 58 of the Act makes it a mandatory requirement for an EIA study to be carried out by proponents intending to implement projects specified in the second schedule of the Act. Such projects have the potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out Environmental Audits in order to determine the

level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and Environmental Audit reports to NEMA for review and necessary action. (Kenya Gazette Supplement, 2015)

Relevance

The proponent has undertaken an ESIA study report to ensure compliance and will undertake subsequent annual environmental audits.

EMCA has provided for the development of several subsidiary legislations and guidelines that govern Environmental Management which are relevant to the current project.

(a) Environmental Impact Assessment and Audit Regulations 2003(Rev, 2016)

The proposed project is classified as a high risk project (Urban development: establishment of new housing estate exceeding 100 units) under Section 58(4) of the Environmental Management and Coordination Act, Rev,2015 legal notice 149 to 150 (Kenya subsidiary legislation 2016) and has been identified as one of the project to undergo EIA. Second Schedule of the Act. Part II of the Regulations indicates the procedures to be taken during preparation, submission and approval of the project study report. (Arrangement of Regulations, 2003)

Relevance.

The proponent has undertaken an ESIA project report to ensure compliance and will undertake subsequent annual audits

(b)The Environmental Management and Co-ordination Act (Water Quality) Regulations, 2006)

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29th September 2006. The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells, and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid, or gaseous substance or deposit any such substance in or near it, as to cause pollution. Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

Regulation 9 of these regulations provides for water quality monitoring. It states that the Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations.

(Environmental Management and Coordination Act, 2006 (2012))

Relevance

During the construction and operation phases, Bestbase Investment Ltd, in conjunction with relevant government agencies, will require constant monitoring in order to ensure that the activities do not affect the water quality of both surface and underground water resources as the proponent aims to comply with the standards specified in this regulation.

(c) The Environmental Management and Co-ordination (Waste Management) Regulations, 2006

These Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29th September 2006. The regulations provide details on management (handling, storage, transportation, treatment, and disposal) of various waste streams including:

- ✓ Domestic waste.
- ✓ Industrial waste.
- ✓ Hazardous and toxic waste.
- ✓ Pesticides and toxic substances.
- ✓ Biomedical wastes.
- ✓ Radioactive waste.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

(i) Improvement of production process through

- ✓ Conserving raw materials and energy.
- ✓ Eliminating the use of toxic raw materials and wastes.
- ✓ Reducing toxic emissions and wastes.

(ii) Monitoring the product cycle from beginning to end by

- ✓ Identifying and eliminating potential negative impacts of the product.
- ✓ Enabling the recovery and re-use of the product where possible.
- ✓ Reclamation and recycling.
- ✓ Incorporating environmental concerns in the design and disposal of a product.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment. Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

(Environmental Management and Coordination Act, 2006(2012))

Relevance

During operational and construction phases, the proposed project will generate both liquid waste and solid waste including metal cuttings, plastics, food wastes among others, the proponent will see to it that the wastes will be disposed as per the guidelines in the regulations.

Regulation 18 requires all generators of hazardous waste to ensure that every container or package for storing such waste is fixed with a label containing the following information:

- ✓ The identity of the hazardous waste.

- ✓ The name and address of the waste generator.
- ✓ The net contents.
- ✓ The normal storage stability and methods of storage.
- ✓ The name and percentage of weight of active ingredients and names and percentages of weights of other ingredients or half-life of radioactive material.
- ✓ Warning or caution statements which may include any of the following as appropriate-
 - the words "WARNING" or "CAUTION"
 - the word "POISON" (marked indelibly in red on a contrasting background; and
 - the words "DANGER! KEEP AWAY / NO ENTRY FOR UNAUTHORIZED PERSONS" and -a pictogram of a skull and crossbones

Regulation 19 (1) requires every person who generates toxic or hazardous waste to treat or cause to be treated such hazardous waste.

(Environmental Management and Coordination Act, 2006 (2012))

Relevance

The project proponent has to ensure implementation of the above mentioned measures as necessary to enhance sound environmental management of waste. Especially for the clinic hazardous waste should be incinerate or disposed of by a licensed waste collector.

4.2.3 The Environmental Management and Coordination Act (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following:

- i. Prohibition of excessive noise and vibration.
- ii. Provisions relating to noise from certain sources.
- iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
- iv. Noise and excessive vibrations mapping.

According to regulation 3 (1), no person shall make or cause to be made any loud unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations that annoy, disturb, injure, or endanger the comfort, repose, health, or safety of others and the environment; or (b) cause to be made excessive vibrations that exceed 0.5 centimetres per second beyond any source property boundary or 30 meters from any moving source.

Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

Regulation 12 (1) makes it an offence for any person to operate a motor vehicle which-(a) produces any loud and unusual sound; and (b) exceeds 84 dB (A) when accelerating. According to sub-regulation 2 of this regulation, no person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident. Regulation 13 (1) provides that except for the purposes specified in sub-Regulation (2) there under, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations

Regulation 19 (1) prohibits any person to carry out activities relating to fireworks, demolitions, firing ranges or specific heavy industry without a valid permit issued by the Authority. According to sub-regulation 4, such permit shall be valid for a period not exceeding three months.

(Environmental Management and Coordination Act, 2006 (Rev 2012))

Relevance

The proposed project site neighbour's residential developments. Noise & vibration nuisance will be highly avoided and in the case of excess noise and vibration, prior preparation and notices should be given to the community and school around at all phases of the project. The contractor /sub-contractor for civil works will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the construction phase. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting of vehicles.

4.2.4 Physical & Land Planning Act 2019

This is the main Act that governs land planning and all proposed developments must be approved by the respective local authority and certificate of compliance issued accordingly. Under the Act, the director of physical planning advises the commissioner of lands on land alienation issues that fall under Government Lands Act and Trust Land Act. The director also advises the commissioner of lands and local authorities on land use, sub-division and or amalgamation of land; prepares regional and local physical development plans.

At the County level, the County physical planning liaison committee comprises heads of the various departments and is chaired by the County Commissioner. One of the major functions of the liaison committee is to determine development applications for change of user or subdivision of land that could have significant impact on adjacent land and or breach registered conditions in a given title deed; and also industrial location which could have negative impact on the environment and adjoining land.

The director is required to publish the regional physical development plan and also notify the local authority within whose jurisdiction the plan is to be affected.

Section 36 states that if in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

Section 30(1) requires a developer in any local authority to be granted development permission by the respective local authority, failure to which heavy fines will ensue; and the land registrar shall decline to register such a document. No sub-division of private land shall take place within a local authority unless the sub-division is in accordance with the requirements of an approved local physical development plan.

(The Physical and Land use Planning Act, 2018)

Relevance

According to this act, the proponent has presented its development plans to the Kilifi County Physical Planning Offices for approval (see annex 4.).

4.2.5 The Water Act 2016

The Water Act No. 8 of 2016 provides for the management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services. Section 18 of this Act provides for national monitoring and information systems on water resources. Following on this, sub-Section 3 mandates the Water Resources Management Authority to demand from any person or institution, specified information,

documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to the authority.

Section 73 of the Act provides that a person who is licensed to supply water have a responsibility of safeguarding the water sources against degradation.

According to section 75(1) such a person is required to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

Section 94 of the Act also makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

(Laws of Kenya- Water Act, 2016 [2012][2002])

Relevance

Bestbase Investment Ltd will be required to monitor continuously the quality of water being abstracted from the borehole(s) as well as any discharge to the surface water resources around the project area. EMCA Water Quality Regulations of 2006 and the Water Act Rev, 2016 as it establishes the Water Resource Authority (WRA) to manage the use of water resources in Kenya. The project proponent is required under this Act to obtain an authorization and abstraction license to drill and abstract water for use respectively.

4.2.6 The Public Health Act (Cap. 242)

This is an Act of Parliament to make provision for securing and maintaining health. Section 115 of this act prohibits causing nuisance or other condition liable to be injurious or dangerous to health. Section 118 provides a list of nuisances that includes any noxious matter, or wastewater, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any watercourse, irrigation channel or bed thereof not approved for the reception of such discharge. (Laws of Kenya- Public Health Act, 2012[1986])

4.2.7 Occupiers' liability CAP 34

This statute dictates that the occupier of premises owes the same duty, the common duty of care, to all his visitors, except in so far as he is free to and does extend, restrict, modify or exclude his duty to any visitor or visitors by agreement or otherwise. (Laws of Kenya- Occupiers' Liability Act, 2012[1980])

4.2.8 The Public Health (Drainage and Latrine) Rules

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

Rule 87 requires every contractor, builder or other person employing workers for the demolition, construction, reconstruction, or alteration of any building or other work in any way connected with building to provide an approved position sufficient and convenient temporary latrine for use by such workers. Rule 91 provides that no person shall construct a latrine in connection with a building other than a water closet or a urinal, where any part of the site of such building is within 200 feet of a sewer belonging to the local

authority that is at a suitable level, and where there is sufficient water supply. (Laws of Kenya- Public Health Act, 2012[1986])

Relevance

This Act is applicable to the project since the contractor for civil works will be required to construct sanitation facilities for use by workers and visitors to the site during the construction. Phase of the proposed project. Bestbase Investment Ltd will be required to work with the Public Health Officers at the County and Sub- County offices in Kilifi to ensure that public health and sanitation standards are maintained during both construction and operation of the proposed project.

4.2.9 The Penal Code (Cap. 63)

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

Relevance

The main contractor for civil works and Bestbase Investment Ltd will be required to ensure strict adherence to the environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impact associated with dust, noise, and effluent discharge.

4.2.10 The County Governments Act 2012

The local government act was repealed after the final announcement of all the results of the first elections held under the Constitution as per the County Governments Act of 2012. Under section 134 subsection (1), The Local Government Act is repealed upon the final announcement of all the results of the first elections held under the Constitution. It further states in section 134, subsection (2) reads "All issues that may arise as a consequence of the repeal under subsection (1) shall be dealt with and discharged by the body responsible for matters relating to transition".

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

Relevance

The contractor will need to abide by all the provisions of the act.

4.2.11 Employment Act

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

53. (1) notwithstanding any provision of any written law, no person shall employ a child in any activity that constitutes worst form of child labour.

56. (1) No person shall employ a child who has not attained the age of thirteen

(2) A child of between thirteen years of age and sixteen years of age may be employed to perform light work which is

(a) Not likely to be harmful to the child's health or development; and

(b) Not such as to prejudice the child's attendance at school, his participation in vocational orientation or training programmes approved by Minister or his capacity to benefit from the instructions received. (Laws of Kenya- Employment Act, 2012[2007])

Relevance

Bestbase Investment Ltd and the contractor will need to understand the requirements of the Act during employment. Equal opportunity should be given to all communities in project area so as to improve the socio-economic status of the area around the proposed project.

4.2.12 Work Injury Benefits Act (WIBA)

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

It outlines the following:

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

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

(The Work Injury Benefits Act, 2007)

Relevance

The contractor will need to abide by all the provisions of WIBA

4.2.13 The Occupational Safety and Health Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes.

It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of this Act is to:

- Secure the safety, health and welfare of persons at work.
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Occupational Safety and Health Act 2007 (OSHA 2007) Kenya Gazette Supplement No.111 (Acts No.15) dated October 26, 2007 revokes the Factories and Other Places of WorkCap.514.

The scope of OSHA 2007 has been expanded to cover all workplaces including offices, schools, academic institutions, factories, and plantations. It establishes codes of practices to be approved and issued by the Directorate of Occupational Safety and Health Services (DOSHS) for practical guidance of the various provisions of the Act. (health.go.ke)

Relevance

The contractor and Bestbase Investment will be required to comply with all the provisions of the Act throughout the project cycle.

4.2.14 The Way Leave Act

The areas zoned for communication lines, sewer lines, power lines, water pipes etc. are known as way leaves. The way leave Act prohibits development of any kind in these designated areas. Thus any developer is bound by this Act to see to it that no development takes place in these areas.

(Laws of Kenya- The Wayleaves Act, 2010[1989])

Relevance

The project proponent is hereby advised not to encroach on any way leave and that he will leave the required space for such services as per the KURA road design projects, and if any case wishes to use the way leave area then he should consult with KURA for approvals.

4.2.15 Climate change act of 2016

This Act shall be applied for the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya.(2) Without prejudice to subsection (1), this Act shall be applied in all sectors of the economy by the national and county governments to mainstream climate change responses into development planning, decision making and implementation; build resilience and enhance adaptive capacity to the impacts of climate change; formulate programmes and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change; mainstream and reinforce climate change disaster risk reduction into strategies and actions of public and private entities; facilitate capacity development for public participation in climate change responses through awareness creation, consultation, representation and access to information. (The Climate Change Act, 2016)

Relevance

The contractor and the proponent will be required to comply with all the provisions of the Act throughout the project cycle to ensure sustainable development.

Table 2 Summary of applicable legislation and regulations

Legislation & regulations	Institution	Relevance in project cycle	Status/Remark
1. EMCA 1999 2. Wetlands, River Banks, Lake Shores and Sea Shore Management Regulations (Legal Notice No 19 of 2009)	NEMA	<ul style="list-style-type: none"> - Issuance of construction & operational license(EIA license) - Monitoring project compliance with approval conditions - Monitoring for compliance with all applicable legislations under EMCA Rev, 2015. - Effluent discharge licence issuance - Enforcement of conservation of riparian, seashore flora & fauna. 	<ul style="list-style-type: none"> - ToR approved - ESIA report submitted
3. Physical & Land Planning Act 2019 4. County Government Act 2012 5. Noise & Excessing vibration pollution control regulations 6. Public Health Act Cap 242 EMC (Waste Management) Regulations, 2006	CGK	<ul style="list-style-type: none"> - Issuance development approval - Noise permitting - Issuance of occupational certificate - Infrastructure provision- utilities & social amenities - Provision of waste management & emergency service - Sanitation & health standards at the project site 	<ul style="list-style-type: none"> - PP2 form & approved drawings attached- Annex
7. Water Act 2016 8. Water Rules 2007	WRA	<ul style="list-style-type: none"> - Issuance of drilling authorisation - Issuance of water abstraction permit 	<ul style="list-style-type: none"> - Hydrogeological report complete Annex
9. OSH 2007	DOHSS	<ul style="list-style-type: none"> - Registration of the construction site as a work place - Enforcing compliance with Occupational Health and Safety Regulations at the construction site 	<ul style="list-style-type: none"> - Pending approval of ESIA
10. Energy Act 2019	EPRA	<ul style="list-style-type: none"> - Enforcement of solar water heating regulations 	<ul style="list-style-type: none"> - Design incorporates 8 solar water heaters per block
11. Wildlife Act	KWS	<ul style="list-style-type: none"> - Conservation of wild flora & fauna 	-
12. Forest Act 2005	KFS	<ul style="list-style-type: none"> - Permit to fell trees 	-
13. National Construction Authority	NCA	<ul style="list-style-type: none"> - Building plans registration 	<ul style="list-style-type: none"> - Pending ESIA licence

5. Project Alternatives

Analysis of alternatives of the proposed Sandy Shores apartment units building project covers the following;

- a) Project alternatives.
- b) Design alternatives.
- c) Alternative use of proposed project site.
- d) Alternative project site.

There are two project alternatives i.e. not to undertake the project (no project alternative) and to undertake the project (yes project alternative). The two project options are analysed below;

5.1 The “no project” alternative

This option will mean that the project will not be undertaken. This implies that the proposed housing project will not be undertaken. This implies that all potential tenants/home owners would have to seek home ownership in alternative developments.

In analysing this option the following was considered;

- ✓ **Technology transfer:** - implementation of the proposed housing development will see transfer of various technologies to our people locally. This includes design technologies for waste water treatment and renewable energy incorporation in buildings. Therefore, the ‘no project’ alternative will not be favourable to this realization.
- ✓ **Contribution to local housing needs;** - it is the government policy to improve and provide housing for its citizens. One way of achieving this is by encourage private sector involvement in contribution in meeting rising housing demand in the country. The proposed apartments if implemented will contribute to meeting housing needs at Kikambala. The no project alternative will negate this potential gain from the proposed project if implemented.
- ✓ **Employment creation;** - the current government policy on employment and wealth creation aims at creating as many jobs as possible to meeting the ever-increasing employment demand in the country. If the ‘no option project’ was to be considered, then this government target may not be realized.
- ✓ **Investor attraction;** - if the no option is considered it will not be consistent with the government aim of attracting investments in the country and especially encourage local private investment in tourism and housing sectors to contribute to addressing rising demand for descent tourism facility in the country.
- ✓ **Financial investment:** -The ‘no’ option will mean that possible occupants of the proposed apartments will have to wait or invest their monies elsewhere.
- ✓ **Income to government** Income in form of taxes to the central government will not be realised.

Therefore, if the no option will be pursued it is likely that we may lose more than what is to be gained if the proposed project is to be implemented.

5.2 The ‘yes’ project alternative

This was considered to be a viable option. This option was considered viable as opposed to the ‘no option’ because the yes project alternative implies that the project be implemented and once implemented there will be a number of gains that will be realised including the following;

- ✓ Boost on investor confidence in the housing sector.
- ✓ More jobs will be created.
- ✓ It will result in further development and improvement of local infrastructure.
- ✓ There will be increased revenue in the form of taxes to the governments.
- ✓ It will be a landmark development.

4.5 Design alternatives

Design alternatives for the proposed RCIL 53 apartment units covers alternative building design and alternative designs of sewage management system.

4.5.1 Preferred building design

The preferred design for the building is three blocks with staggered heights as follows. This design is preferred because of the following: -

- ✓ Staggered heights of building ensures that all tenants have an obstructed view of the sea.
- ✓ Flow of sea breeze will be optimised across the entire development.
- ✓ High density development can be achieved with storey buildings.
- ✓ The topography of the land is fully exploited.
- ✓ Above ground space will be utilised as opposed to non-storey building.
- ✓ A storey building will occupy less ground space as opposed to non-storey.
- ✓ More ground space will be available for gardening and parking as opposed to non-storey building.

5.3 Alternative building design

Alternatively, the building can be of a multi- storey design or non-storey.

ADVANTAGES OF SINGLE STOREY BUILDING INCLUDE;

- ✓ Causes minimal obstruction
- ✓ Easy to build using simple tools and equipment
- ✓ Less prone to collapsing in event of tremors or poor workmanship compared to high-rise building.

DISADVANTAGES OF SINGLE STOREY BUILDING INCLUDE;

- ✓ Maximum land value is not realised.
- ✓ Less above ground space is utilized.
- ✓ Minimal units can be built in a given space.
- ✓ Maximum economic returns from a given space cannot be realised.
- ✓ Fewer people can be accommodated in a given area.

ADVANTAGES OF MULTI-STOREY BUILDING;

- ✓ Maximum returns on land value can be attained.
- ✓ Many units can be built in a given space.
- ✓ Maximum utilization of above ground space can be achieved.
- ✓ Both beneath ground and above ground spaces can be effectively utilised for maximum economic returns.
- ✓ Local aesthetics is changed for the better.

DISADVANTAGES OF MULTI-STOREY BUILDING;

- ✓ Visual obstruction.
- ✓ More prone to effects of tremors and earthquakes.
- ✓ Requires sophisticated equipment to build.

In light of the above analysis, storey building will be preferred to non-storey because;

- ✓ Land is a finite resource; to attain maximum use of it will be prudent to encourage storey housing development as opposed to non-storey since we cannot increase available land space, what is left is to find ways of sustainable and effectively utilizing of the available finite space for maximum returns.
- ✓ In order to address housing needs in a rapidly developing urban setting storey buildings will be more effective in addressing these need as more people can be accommodating in a given space.
- ✓ It will be more cost effective to invest in storey building in the present than wait in the future to rebuild the same.

5.4 Preferred design for the sewage management system

The proposed housing project proposes to use a WWTP to manage sewage from the housing units.

5.5 Alternative sewage management systems

Three other alternative sewage management design and technologies are available namely KEE Nudisc treatment system, Biobox sewage treatment system and Klargesster Biodisc system.

1. THE KEE NUDISC TREATMENT SYSTEM

The KEE NuDisc treatment system has a recycling element where all wastewater will be treated and recycled for reuse in toilets and irrigating lawns and flower gardens. The KEE NuDisc treatment system has the following features;

- ✓ The treatment system is carbonaceous, nitrification and nutrient removing.
- ✓ The system provides BOD (Biological Oxygen Demand) removal, nitrification and nutrient removal.
- ✓ The whole plant is contained in a grassfire reinforced polyester tank designed to a structural code for partial installation in the ground with only the cover showing up.
- ✓ The system consists of a primary settlement stage, sludge storage, organic and hydraulic balancing through anoxic stage, aerobic stage, and final settlement for removal of aerobic solids.

2. THE BIOBOX SEWAGE TREATMENT SYSTEM

Biobox Enpura is a complete waste water treatment system (typically known as a packaged plant), suitable for establishments producing from 2m³ up to 320m³ (320,000l) of sewage per day. A Biobox Enpura sewage treatment plant treats the effluent on-site and produces clear, odorless and environmentally safe water for the irrigation of shopping, sports fields, golf courses and agricultural plots – or for filling dams or simply to return it to the environment in streams, rivers or dams. The system is modular in design and can thus be replicated to meet increasing demands for treatment from 2m³ up to 320m³ (320,000l) per day if required. Biobox Enpura can treat both grey water (from laundries, baths, basins, kitchen sinks) and black water (toilet water). The waste water is gravity fed or pumped from the existing or new septic tank

The system involves pumping wastewater from source or septic tanks to a series of bioreactors; the effluent is then treated by means of aerated fixed film technology. Bacteria in the effluent lodge onto the film inside the bioreactors where they grow living on the nutrients in the effluent once they mature they die and the air scours off the film. The effluent then is passed through the clarifier where the sludge settles at the bottom and the clear water separates at the top. The clear water will be sterilized by means of contact chlorination system, ozone or alternative technology before discharge into the environment. The accumulated sludge at the bottom of the clarifier is recycled back into the septic tank where it is digested thus creating an ideal environment for the pre-digested raw sewage before entering the sewage treatment system.

3. KLARGESSTER BIODISC SYSTEM

The Klargesster biodisc system has five chambers through which the sewage moves and gets treated by use of microbial digesters. To ensure comprehensive sewage treatment and disposal capacity the system is designed to accept the full water rate, biological load and 100% nominal flow to accommodate a maximum daily flow rate of 3.6m³ and a biological load of 1.08

Kg. A sludge-return pump is included within the unit to enhance performance and is configured to help overcome seasonal flow variations to ensure a consistent biomass during low-use or non-use periods. This type of sewage treatment technology produce a high quality treated wastewater that can be used for irrigation. Standard final effluent discharge is 20mg/l BOD, 30mg/l Suspended Solids (SS). Reduction of the BOD and SS to less than 10mg/l may be achieved using a pressurized sand filter or chemical dosing system. If required, an appropriate UV system may be installed to provide comprehensive effluent disinfection.

The Biobox sewage treatment system would be most appropriate for the needs of the proposed facility given its modular nature that gives it flexibility in terms of the amount of waste water it can handle.

5.6 Alternative use of proposed project site

Preferred use

The preferred use of the proposed project site is high end housing units. This is the preferred use because: project site has ample space to accommodate all components of the proposed 184 housing units; topography of the land gives an expansive Seaview; in a relatively quiet location. The beachfront location also provides opportunity for various water sports and recreational activities. The Kijipwa airstrip which is about 1.8 Km from the site improve the accessibility of the project area and it also increases the value of property.

Alternative use of proposed project site

Other alternative use of the proposed project site may include the following;

- ✓ The site can be used as a limestone quarry.
- ✓ The site can be used for marine conservation work.
- ✓ The site can be used as a fish landing site cum public beach.

The existing high-end gated apartment such as Sultan apartment and aqua villas which are compatible to the proposed development have set a precedent and made the area more attractive for the current proposed land use.

4.9 Alternative project site

As land space within Nyali and other parts of Mombasa dwindle, most high and middle class have been relocating to the Kikambala/ Vipingo area. This is a greater opportunity for the project area through the following; the land and property value in the area will increase, investments of similar nature will increase in the area and the apartments that will be developed in the area will find market since the area is the new frontier. Alternative sites for construction of the proposed project site may have to be;

- ✓ On a beach front with similar acreage of plot size.
- ✓ In ownership by the project proponent or an associate.
- ✓ Accessible with essential infrastructure.

Such alternatives sites meeting the above criteria are not in the possession of Bestbase Investment Ltd and thus deemed unfeasible for development of the proposed project.

6.PUBLIC CONSULTATION & FEEDBACK

6.1 Introduction

Consultation with various stakeholders and public participation was done throughout the Environmental Impact Assessment Project Report preparation and compilation. This was in line with the requirements of Legal Notice No. 101, Kenya Gazette Supplement No. 56 of June 13th 2003, the Environmental (Impact assessment and Audit) Regulations, 2003. Consultations and public participation was encompassing, interactive and intensive, so as to ensure that as many stakeholders as possible and the public were reached. Special attention was paid to general public especially those drawn from the proposed project site, Msumarini area of Kikambala and the immediate neighbourhood. Views, comments, concerns and opinions of stakeholders concerning the proposed project were sought. The consultation was vital as it served to;

- ✓ Inform all stakeholders of the proposed development within their locality.
- ✓ Explain to the stakeholders the nature of the proposed project, its objectives and scope.
- ✓ Give stakeholders a forum to present their views, concerns and issues regarding the proposed development.
- ✓ Obtain suggestion from stakeholders on possible ways that potential negative impacts can be effectively mitigated.

The consultation was in the form of site visits, questionnaire survey and public baraza.

6.2 Consultation schedule

Public consultation barazas were organised through the office of the chief, Kikambala location. Once the dates and venues of the meeting had been confirmed, public notices in A3 sizes were published and affixed at the venues 2 weeks prior to the meeting dates to create awareness on intended meetings. The public meetings were also published on the national radio station -Kenya Broadcasting Corporation- Kiswahili service on the dates of 15th of August 2019 and 26th August 2019. The infomercial was run at 1300 hrs, 1900 hrs and 2100hrs on both days before the news bulletin. An audio of the commercial is attached with the soft copy of this report.

Table 3 Schedule of ESIA public barazas

Meeting	Venue	Date
Public Baraza	Msumarini Primary	27 th August 2019
Public Baraza	Kamkunji meferejini B	28 th August 2019
Public Baraza	Project Site-Kwa Piri	29 th August 2019



Figure 12 1st ESIA public baraza at Msumarini primary school



Figure 13 2nd ESIA public baraza at Mferejini-Kamkunji centre



Figure 14 3rd ESIA public baraza at project site

6.3 Summary of issues raised from the consultation process

ISSUES RAISED	RESPONSE/ DISCUSSION
Msumarini beach as a turtle nesting site	<ul style="list-style-type: none"> • The area must be fenced off. • There must be low lighting towards the shore. • The area to be maintained and conserved from destruction.
Solid waste disposal.	<ul style="list-style-type: none"> • All solid waste to be collected, handled, managed and disposed according to the Environmental Management and Coordination (Waste Management) Regulations, 2006. • 2 solid waste holding sections provided for in the development plan. • All waste generated will be collected will be collected and disposed at NEMA licensed disposal sites only • The project proponent to hire the services of a NEMA registered waste collection and disposal company that will be collecting all solid waste generated from the proposed construction site and dispose the collected waste to NEMA licensed disposal sites. • Waste receptacles to be provided at the construction camp for holding of waste • Routine beach clean ups to be organized
Liquid waste disposal	<ul style="list-style-type: none"> • Establishment of septic tank systems to arrest all waste water at a point. • Recommendation to the proponent to install a Bio digester system. The developer will be required to have affluent discharge license renewed every year. • Adequate sanitary facilities be made available at the site for construction workers • All liquid waste generated on site should be collected in mobile tankers and later disposed to a NEMA licensed wastewater recycling facility on a continuous basis until the wastewater recycling facility on site is constructed and operational. • All liquid waste to be collected, handled, managed and disposed according to the Environmental Management and Coordination (Water Quality) Regulations, 2006.
Noise, Dust and Air Emissions.	<ul style="list-style-type: none"> • Carrying out of Noise survey to determine the trends/dynamism of such. • Sprinkling of water & paving of the road to reduce dust from traffic movement. • Continuous watering of the earth roads to control dust • The developer to use the cut and fill method during excavation. • Construction exercise will be carried out only during the day. • Yearly environmental audit.
Fresh water access to the locals.	Equal distribution according to the mode of application through the KIMAWASCO for availability to all.

ISSUES RAISED	RESPONSE/ DISCUSSION
Socio-economic concerns: <ul style="list-style-type: none"> ○ Teenage pregnancies ○ Women & disabled opportunity access ○ Msumarini Beach access by the public ○ Discrimination of local & non-locals for opportunities ○ Non-payment of canteen bills 	<ul style="list-style-type: none"> ● Local community to be given priority for employments & tenders on the sites to reduce cultural related conflicts by emigrant labour ● Local community to be prioritized for skilled & non-skilled labour ● Consideration shall be taken for the disabled community members in different areas of their capabilities. No form of discrimination whatsoever ● The proponent recognizes the gazetted Public Beach access route near Paradise Hotel. ● Identified beach access route to be cleared to ensure the public safely access the beach. ● Contractor to aid food vendors by ensuring vetted site workers can access meals on credit & pay as per contract.
Water demand at the project site.	<ul style="list-style-type: none"> ● A borehole is to be drilled on the project area to supplement the water requirements. ● There is piped water in the area. ● There will be water reservoirs at the project site to alleviate the pressure.
Safety at the site.	<ul style="list-style-type: none"> ● Need for vehicles transporting materials to the site to maintain speed limit. ● Proponent/Contractor to provide safety gear for the site workers such as helmets and safety boots.

The certified minutes of the deliberations and resolutions are attached in annex 10 of this report.

6.4 Consultations beyond ESIA Process

In order to ensure that the development runs smoothly, consultations should be structured to aid the completion of the project implementation. These consultations should therefore be preceded by further engagement of various stakeholders under the following stages:

- Construction phase and reported through the Initial Environmental Audit; and
- Operation phases and reported through the Statutory Environmental Audit of the project.

The consultation should address pertinent issues including the sustainability and suitability of the operation and maintenance to ensure acceptable standards

7.IMPACTS PREDICTION & MITIGATION

Impact Assessment and Scoring

The potential impacts associated with the proposed development have been assessed as presented in the table below. Precautionary principle was used to establish the significance of impacts and their management and mitigation i.e. where there is uncertainty or insufficient information, the Environmentalist erred on the side of caution.

	Severity of the impact	Rating	Scoring
1.	Insignificant / non-harmful/less beneficial	-1/+1	Very Low
2.	Small/ Potentially harmful / Potentially beneficial	-2/+2	Low
3.	Significant / slightly harmful / significantly beneficial	-3/+3	Medium
4.	Great/ harmful / beneficial	-4/+4	High
5.	Disastrous/ extremely harmful / extremely beneficial	-5/+5	Very high
Spatial Scope of the Impact			
6.	Activity specific	-1/+1	Very Low
7.	Right of way specific	-2/+2	Low
8.	Within Project area 5km radius	-3/+3	Medium
9.	Regional	-4/+4	High
10.	National	-5/+5	Very high
Duration of Impact			
11.	one day to one month	-1/+1	Very Low
12.	one month to one years	-2/+2	Low
13.	Within Project construction period	-3/+3	Medium
14.	within the Project life	-4/+4	High
15.	at decommissioning	-5/+5	Very high

Example of Cumulative Impact Scoring: 1. +3, +2, +5, +4, +4, +1=+4 (the weight that occurs more is adopted) 2. +2, +2, +5, +4, +4, +1=+3 (if two scores or more tie, then an average of the scores shall be adopted)

8.POTENTIAL IMPACTS

The proposed housing development project will result in both positive and negative impacts to the physical, biophysical and socio-economic environment. All feasible measures should be put in place to ensure that; any significant negative impacts are mitigated; positive impacts are enhanced and maximized and local people from neighborhood benefit positively from the project.

8.1 Potential positive impacts from the implementation of the project

Positive impacts likely to result from implementation of the proposed project will include;

- ✓ Creation of jobs.
- ✓ Boosting of upmarket housing needs in Kikambala area.
- ✓ Boost of property value in Kikambala.
- ✓ Beautification of locality.
- ✓ Lighting of locality.
- ✓ Support of local businesses.
- ✓ Infrastructure development.
- ✓ Revenue to government.

JOB OPPORTUNITIES

Construction sites are a major source of employment opportunities. Although the jobs are not permanent, a considerable number of casuals and contracted people are able to get employment opportunities. The proposed project will create employment opportunities for local youths. This will contribute positively to realization of government target of creating jobs annually.

BOOSTING OF UPMARKET HOUSING NEEDS IN KIKAMBALA AREA

Kikambala area of the proposed project site is sandwiched between Mombasa city which is the second largest city in Kenya and Kilifi town which is one of the coastal towns. Like other cities and towns in Kenya, both Mombasa and Kilifi counties are faced with the challenges of increasing demand for housing. This demand is occasioned by rural urban migration and urban to urban migration. The proposed project will positively contribute to alleviating housing needs in the two counties.

BOOST OF PROPERTY VALUE IN KIKAMBALA

The proposed project will involve construction of housing units on a beach plot. Once constructed the proposed development will significantly contribute in raise raising the value of land and other properties within the project catchment area.

BEAUTIFICATION OF LOCALITY

The project will result in beautification of the locality. This will include development and widening of local access road, development of storm water drainage, development of beach access route. Development of some of these infrastructures will significantly contribute to beautification of the locality.

LIGHTING OF LOCALITY

The nature of the project will require improved lighting of the area; the lighting will have to stretch outside the project boundaries. Lighting should begin from the access road properly from Paradise Beach Resort and continue to pedestrian walkways around the property development. This will improve on local security and overall safety of the area and within the developed property.

SUPPORT OF LOCAL BUSINESSES

The proposed project will require the services of different expertise during the implementation stage. This will include contractors and consultants who will be hired to work in different sections of the project. Others will be transporters, suppliers and other services providers to the project will have new business opportunity opening as a result of the project. Thus all in the entire project will contribute to support of local businesses.

INFRASTRUCTURE DEVELOPMENT

Local infrastructure like local access road, beach access route, lighting, football ground at Msumarini primary/secondary school, development of ground water resources is likely to accrue to the project area.

REVENUE TO LOCAL GOVERNMENT

Once implemented, the proposed project will boost revenue collection for the Kilifi Country government in form of land rates, licenses and permits, farther more government revenue will be remitted to exchequer in form of statutory fees.

8.2 Potential negative Impacts from implementation of the project

Key potential negative environmental impacts are likely to result from the proposed Sandy Shores Apartment during both the construction and operational phase of the project as discussed below;

Construction phase impacts	Operational phase impacts
<ul style="list-style-type: none"> <input type="checkbox"/> Dust nuisance <input type="checkbox"/> Noise nuisance <input type="checkbox"/> Vegetation loss <input type="checkbox"/> Impact on beach <input type="checkbox"/> Impacts of solid waste <input type="checkbox"/> Impacts of sewage <input type="checkbox"/> Increase in vehicular traffic <input type="checkbox"/> Occupational hazards 	<ul style="list-style-type: none"> <input type="checkbox"/> Impact on beach; <input type="checkbox"/> Impacts of solid waste <input type="checkbox"/> Impacts of sewage <input type="checkbox"/> Increase in vehicular traffic in the area <input type="checkbox"/> Increased demand for water and electricity supply

An in-depth analysis of each of the potential negative impacts is as follows.

IMPACTS ON THE BEACH

The proposed location of the proposed villas and apartments is on the first row from the beach. Taking into account of this proposed location, it is likely that implementation of the proposed housing project may result in negative impacts to the beach and the local marine environment in general depending on how the implementation is carried out. If the implementation is carried out in such a way that it does not regard and conserve the riparian vegetation while at the same time ensuring public access to the beach is not interfered, then such an implementation may result in the following negative impacts to the beach;

- ✓ Sea turtles nesting restrictions.
- ✓ Beach pollution.
- ✓ Beach erosion.
- ✓ Destruction of riparian vegetation.

- ✓ Restricted beach access.

SEA TURTLES NESTING RESTRICTIONS

Sea turtles have changed little since the dinosaur's era, yet in the past few decades their numbers have crashed dramatically and they are all under threat of extinction. Five of the world's seven species of sea turtles can be found in the waters off the East African coast. The Green turtle (*Chelonia mydas*) are regularly sighted out at sea, in the coastal shallows and even on the beaches where they nest. (Sea Turtles of The Swahili Coast, 2012)

Other species documented as occurring within Kenyan waters; Hawksbill turtle (*Eretmochelys imbricata*), Loggerhead turtle (*Caretta caretta*), Olive ridley turtle (*Lepidochelys olivacea*) and Leatherback turtle (*Dermochelys coriacea*).

There are various laws prohibiting hunting, removing, holding, moving and trafficking sea turtles and their products whether dead or alive such as the Wildlife Act (Cap 376) and the Fisheries Industry Act (Cap 378). However, there is no legislation protecting key nesting and foraging habitats utilized by sea turtles except for those falling within marine protected areas. (Brendan J. Godley & Annette C. Broderick, 2004)

Green sea turtles are protected under various international accords and conventions such as the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) where it was listed under Appendix II in 1975. The species was later reclassified as endangered under the EN A2bd criteria, which essentially states the wild populations face a higher risk of extinction because of several factors. According to The International Union for the Conservation of Nature (IUCN), the green sea turtle has been repeatedly listed in its Red List under differing criteria. In 1982, they official classified it as an endangered species. (Integrated Taxonomic Information System, 2007)

Sea turtles usually mate in shallow coastal waters, followed by the female coming ashore to nest, a very vulnerable time for her. A female sea turtle digs a pit in the beach sand, which she fills with her eggs and covers over. The eggs hatch approximately 60 days later when the hatchlings make their perilous journey from nest to sea. Vipingo beach area favours nesting activity due to the beaches steep gradient. Short beaches with a steep gradient are considered safe from being inundated by sea water and the vegetation present tends to hold the sand together preventing crumbling and suffocation of some hatchlings. (Simon M. Mathenge, Benjamin N. Mwasi & Shem M. Mwasi, 2012)

Individuals as well as organisations are working with local fishermen specially to try to stop the endangered reptile being caught on purpose. But the turtles are also losing their breeding grounds to erosion and construction. (Soi, 2019)

Organisations such as Baobab Trust run and facilitate a turtle conservation project since 1989 along the Kenyan Coast. It works with fishermen to ensure nest protection and continue with awareness which is still required whilst on the beaches. (Baobab Trust, 2010)

During the reproductive period, both adults and eggs are vulnerable to habitat destruction, predation, artificial lighting, beach armouring, plastics and other marine debris. (Pritchard, 1979)

Major threats to sea turtles include.

- ⇒ Beach pollution
- ⇒ Beach erosion
- ⇒ Destruction of riparian vegetation
- ⇒ Predators: stray dogs
- ✓ Artificial lighting

DESTRUCTION OF RIPARIAN VEGETATION.

Built up areas and thickets that are close to the beaches influence the suitability of nesting beaches. Development e.g. construction of sea walls where nests are located hinder accessibility by hatchling to the water.

BEACH POLLUTION

Encroachment by manmade structures prevents the natural movement of sand thus resulting in the degradation of beach habitats through factors such as beach erosion. Most nests are found at the vegetation line with common vegetation present being vines. (Simon M. Mathenge, Benjamin N. Mwasi & Shem M. Mwasi, 2012). Beaches suitable for nesting compose of sandy surface material. Areas with obstacles such as debris washed ashore e.g. concrete blocks from destroyed sea walls are a hindering factor to turtle nesting. Consequently many mature females may fail to nest in suitable nesting habitats since they nest on specific beaches, that is, their natal beach where they were incubated and hatched in the past. (Bowen, B.W., A.B. Meylan & J.C. Avise, 1989)

BEACH EROSION

Human activities of sand harvesting and construction of buildings and walls close to the sea and beach tourist activities are major factors leading to beach changes. (Nelson, D. & D.D. Dickerson, 1988)

Removal of sand from the beaches may expose already laid eggs or tamper with the optimum nesting conditions of turtles such as soil temperature.

PREDATORS: STRAY DOGS AND ARTIFICIAL LIGHTING

This is majorly to occur in the occupational phase and is a major deterrent to successful nesting and breeding by turtles. Predators in this case being stray dogs can dig up laid eggs to uncover eggs underneath or prey on hatchlings making their way to the water.

Breeding turtles are sensitive to artificial lighting. This deters them from coming up the beach and laying their eggs.

SAFEGUARD FOR MARINE TURTLES & HABITAT:

- ✓ There should be no disposal of any solid or liquid waste within the riparian vegetation of the wider beach environment.
- ✓ Ensuring that no construction activity takes place within a range of 60 meters from the high watermark.
- ✓ There should be no cutting and or removal of vegetation or any dry plant matter from the riparian vegetation.
- ✓ There should be no introduction of alien species or planting of exotic vegetation within the riparian zone.
- ✓ There should be no removal of soil or organic manure from the riparian vegetation zone.
- ✓ There should be no removal of any beach sandy for construction work or any other use.
- ✓ No physical solid structures such as walls should be constructed within the riparian zone of the beach.
- ✓ All construction activities should be limited to the official plot boundaries while ensuring that the prescribed riparian zone is not encroached nor disturbed in any way.
- ✓ The proponent should engage the services of locally established conservation entities dealing with turtle conservation to identify and tag egg nests and ensure minimal disruption to the natural processes.
- ✓ The security guards should be made aware against shining lights on turtles as this discourages them from coming ashore to lay eggs.

BEACH POLLUTION

Potential beach pollution from implementation of the proposed project may be likely in two phases namely during the construction phase and during the occupation phase. Beach pollution likely to be experienced from each the phase may be different.

Beach pollution during construction phase

During construction phase, beach pollution may occur as a result of the following activities;

- ✓ Disposing of construction waste within the riparian vegetation.
- ✓ Disposing of construction solid waste on the beach.
- ✓ Channelling of liquid waste into the beach.

- ✓ Channelling of liquid waste into the riparian vegetation reserve.

✓

DISPOSING OF CONSTRUCTION SOLID AND LIQUID WASTE WITHIN THE BEACH RIPARIAN ZONE

The riparian zone of the beach is an integral and important part of the beach ecosystem and indeed the wider marine environment. The riparian vegetation forms an important habitat for various activities of marine organisms. This vegetation forms a vital feeding ground for some marine organisms, a vital spawning ground for crustaceans and other marine fisheries, riparian vegetation too is an important hatchery and roosting ground for marine life. During construction phase both liquid and solid waste will be generated, some of the likely solid waste may include concrete waste, pieces of stone and rock material, empty cement bags, worn-out dust screen material, timber off cuts, off cuts of PVC pipes and other polyethylene materials such as conduits, off cuts of metals. Apart from construction activities other solid waste will be generated from construction camp and this will include food leftovers, food packaging materials such as plastic containers including bottles, jars, and cans, carton boxes, plastic bags. Likely liquid waste to be generated may include wastewater from construction camp and this will likely be generated from food preparation activities, washing, cleaning and from sanitary facilities of construction staff. If all this waste is disposed within the riparian zone of the beach it will result in significant pollution of the beach riparian zone which will eventually destroy the entire beach riparian ecosystem.

Potential negative impacts likely to result from disposing of construction solid and liquid waste within the beach riparian zone may include the following;

- ✓ Destruction of riparian vegetation within the riparian zone, this will negatively impact on marine organisms that directly and indirectly depend on the riparian zone for their physiological and biological activities. This will directly translate to reduction of numbers and population of such marine organisms.
- ✓ Disposing of solid and liquid waste will result in contamination of the riparian vegetation and environment. This will render such environment not conducive for use by marine organisms for their various biological functions such as roosting, hatchery and feeding. This will directly negatively affect the productivity and specific reproduction of such marine organisms.
- ✓ Disposal of liquid and solid waste within the riparian zone of the beach may result in direct death of plant and animal life within the riparian zone;
- ✓ Disposal of liquid and solid waste within the riparian zone will directly contaminate soils within the riparian zone, this will negatively affect marine animals such as sea turtle that barrow riparian soils to lay their eggs as such contaminates soils may not be conducive for such biological function, this will result in reduced productivity of such marine organisms.

PROPOSED SAFEGUARDS AGAINST OF BEACH POLLUTION

- ✓ All solid waste to be collected handled, managed and disposed according to the Environmental Management and Coordination (Waste Management) Regulations, 2006.
- ✓ All liquid waste to be collected handled, managed and disposed according to the Environmental Management and Coordination (Water Quality) Regulations, 2006.
- ✓ There should be no disposal of any solid or liquid waste within the riparian vegetation of the wider beach environment.
- ✓ Adequate waste receptacles to be provided at the proposed project site where all waste generated will be collected and dropped inside from where such waste will later be collected and disposed at NEMA licensed disposal sites only.
- ✓ Waste receptacles to be provided at the construction camp for holding of solid waste;

- ✓ Project proponent to hire the services of a NEMA registered waste collection and disposal company that will be collecting all solid waste generated from the proposed construction site and dispose the collected waste to NEMA licensed disposal sites.
- ✓ Vehicles that will be used to collect solid waste from the proposed construction site for disposal must be licensed by NEMA.
- ✓ All liquid waste generated on site should be collected in exhausters and disposed to a NEMA licensed wastewater recycling facility on a continuous basis until the wastewater recycling facility on site is constructed and operational.

DESTRUCTION OF RIPARIAN VEGETATION

Riparian vegetation along the beach is of important ecological significance. Riparian vegetation along the beach plays an important role in beach conservation. This includes breaking of sea waves and hence encouraging deposition; riparian vegetation act as a sheltered place which is a spawning ground for marine organisms, riparian vegetation along the beach deter and prevent beach erosion.

Destruction of riparian vegetation may be caused by the following;

- ✓ Encroachment to the riparian zone.
- ✓ Dumping of waste in the riparian vegetation zone.
- ✓ Cutting and removal of riparian vegetation.

Encroachment to the riparian zone occurs through the following:

- ✓ Carrying out developmental activities outside the demarcated boundaries of the beach plot as indicated in the title deed.
- ✓ Carry out developmental activities within the regions of 60 meters from the high watermark.
- ✓ Cutting and removal of natural vegetation natural growing in within the region of 60 meters from the high watermark.
- ✓ Planting and introducing of alien vegetation within a region of 60 meters from the high watermark.
- ✓ Erecting embankments including boundary wall within the region of 60 meters from the high watermark.

Encroachment of the riparian vegetation will result in destruction of riparian vegetation which is vital in protecting and conserving the marine environment, exposing the beach to wave activity and beach erosion, destabilization of local ecological balance, destruction of important breeding grounds of some marine organisms and reduction of sand deposition during high tide.

Dumping of waste in the riparian vegetation zone

The riparian zone of the beach is an integral and important part of the beach ecosystem and indeed the wider marine environment. The riparian vegetation forms an important habitat for various activities of marine organisms. This vegetation forms a vital feeding & spawning ground for crustaceans and other marine fisheries. Riparian vegetation is also an important hatchery and roosting ground for marine life. During construction phase both liquid and solid waste will be generated, some of the likely solid waste may include concrete waste, pieces of stone and rock material, empty cement bags, worn-out dust screen material, timber off cuts, off cuts of PVC pipes and other polyethylene materials such as conduits, off cuts of metals. Apart from construction activities other solid waste will be generated from construction camp and this will include food leftovers, food packaging materials such as plastic containers including bottles, jars, and cans, carton boxes, plastic bags. Likely liquid waste to be generated may include wastewater from construction camp and this will likely be generated from food preparation activities, washing, cleaning and from sanitary facilities of construction staff. If all this waste is disposed within the riparian zone of the beach it will result in significant pollution of the beach riparian zone which will eventually destroy the entire beach riparian ecosystem. The plates below capture some of the riparian vegetation together with the wider beach ecosystem.



Figure 15 Mangrove vegetation in riparian zone of Msu beach & the sandy beach during low tide

Cutting and removal of riparian vegetation from the riparian zone.

Riparian vegetation act as a natural physical barrier that aid in breaking the force of waves and thus prevents beach erosion while at the same time encourage sand disposition and thus enhancing development, maintenance and sustenance of a sandy beach. Riparian vegetation within the riparian reserve of the proposed project site has developed extensive strong root network that is able to effectively resist and break potential wave force and effectively reduce potential wave erosion on site, the roots trap the sand that comes with the waves and hence deposition occurs. This has progressively protected the beach from wave erosion and instead encouraged sand deposition and thus development of a sandy beach. Further the riparian vegetation has played a key role in ensuring that erosion of hinterland is avoided, the riparian vegetation thus has sheltered the land after the beach. The riparian vegetation thus performs a number of ecological functions in the sustenance and balance of the interaction of sea and dry land. It is on this basis that the riparian zone and all its vegetation must be protected and conserved as this will protect the beach from being eroded as a result of the strong waves.

POTENTIAL NEGATIVE IMPACTS OF DESTRUCTION OF RIPARIAN VEGETATION

Destruction of local riparian vegetation may result in the following negative impacts;

- ✓ Loss of natural physical barrier to break wave action in order to deter beach erosion and encourage sand deposition.
- ✓ Increased beach erosion.
- ✓ Eventual loss of sandy beach.
- ✓ Reduced beach sand deposition.
- ✓ Destruction of natural habitat for some marine organisms.
- ✓ Destruction of breeding grounds for some marine organisms.
- ✓ Destruction of feeding and roosting ground for some marine organisms.

PROPOSED RIPARIAN VEGETATION SAFEGUARDS

- ✓ Ensuring that no construction activity takes place within a range of 60 meters from the high watermark.
- ✓ Prohibition of dumping and or disposal of waste both solid and liquid within the riparian reserve.
- ✓ Prohibition of cutting and or removal of vegetation or any dry plant matter from the riparian vegetation.
- ✓ Prohibition of introduction of alien species or planting of exotic vegetation within the riparian zone.
- ✓ Prohibition of removal of soil or organic manure from the riparian vegetation zone.

- ✓ Prohibition of adding of fertilizers to vegetation within the riparian zone.

BEACH EROSION

Development of beach plots along the Kenyan Coast is associated with activities such as introduction of beach embankments, destruction and removal of riparian vegetation and removal of beach sand. One or a combination of these activities associated with development of beach plot can result in beach erosion. Beach embankments can potentially destabilise beach process resulting in beach erosion. The destabilization can be occasioned by the following among others; activities that will result in disturbance of beach sand; this can include trenching on the beach or actual removal of beach sand, physical removal of flora within the riparian zone which acts as a natural barrier to break sea waves and hence sand deposition and introduction of hard solid barriers along the beach that interfere with local tidal dynamics

Beach erosion is likely to be caused by:

- ✓ Cutting and removal of riparian vegetation from the riparian zone.
- ✓ Physical removal of beach sand from the beach.
- ✓ Introduction of solid physical barriers along the beach frontage.
- ✓ Change in local tidal regime.

Cutting and removal of riparian vegetation from the riparian zone

Riparian vegetation act as a natural physical barrier that aid in breaking the force of waves and thus prevents beach erosion while at the same time encourage sand disposition and thus enhancing development, maintenance and sustenance of a sandy beach. Riparian vegetation within the riparian reserve of the proposed project site has developed extensive strong root network that is able to effectively resist and break potential wave force and effectively reduce potential wave erosion on site, the roots trap the sand that comes with the waves and hence deposition occurs. This has progressively protected the beach from wave erosion and instead encouraged sand deposition and thus development of a sandy beach. Further the riparian vegetation has played a key role in ensuring that erosion of hinterland is avoided, the riparian vegetation thus has sheltered the land after the beach. The riparian vegetation thus performs a number of ecological functions in the sustenance and balance of the interaction of sea and dry land. It is on this basis that the riparian zone and all its vegetation must be protected and conserved as this will protect the beach from being eroded as a result of the strong waves.

Physical removal of beach sand from the beach

Physical removal of beach sand from the beach can trigger and result in beach erosion. Removal of beach sand will create depressions within the beach environment, this will result in creeping of sand from upper areas towards lower areas, this creeping of sand aided with agents of erosion such as water (through wave action) and wind will result in beach erosion. Physical removal of sand will not only result in beach erosion but will deplete quantity of beach sand, destroy natural sandy beach, destroy habitat of beach dwelling marine organisms and destroy off sea marine environment.

Introduction of solid physical barriers along the beach frontage

Introduction of solid physical barriers along the beach frontage can contribute and result in erosion of the beach and beach environment. Such barriers which are solid in nature interfere with the free flow of ocean water during low and high tide; and since the said solid barriers are not porous to necessitate systematic wave breaking while at the same time allowing the water to freely flow no deposition occurs instead erosions results. This is because such solid structures stop wave action instantly thus creating a force that washes beach sand back into the sea and thus resulting in beach erosion.

Change in local tides

Change in local tides can result in beach erosion. Changes in local tides can be triggered by natural phenomenon such as earthquakes, tectonic plates moving towards each other, far from each other or sliding past each other. This natural

phenomenon results in tsunamis which are responsible for devastating beach and offshore destructive activities including severe erosion.

POTENTIAL NEGATIVE IMPACTS OF BEACH EROSION

Beach erosion may potentially result in the following negative impacts;

- ✓ Massive loss of beach sand, most of the sand may be eroded away resulting in a rocky beach. In such a case all the sand is eroded to a level where coral rag outcrops are exposed.
- ✓ Beach habitat for marine organisms will be destroyed; this will negatively impact on the population and survival of marine organisms.
- ✓ Destruction of off sea marine environment; an eroded beach will expose the wider marine environment off the beach for destruction as it will not be sheltered.
- ✓ The beautiful beach aesthetics will be lost; this will negatively impact on tourism as there will be reduced tourists and natural enthusiast to such destroyed beaches net result reduced government revenue from tourism.
- ✓ Destruction of local aesthetics.

PROPOSED SAFEGUARDS AGAINST BEACH EROSION

- ✓ There should be no removal of any beach sandy for construction work or any other use.
- ✓ There should be no cutting or removal of any riparian vegetation or any dead or dry vegetation matter from the riparian zone as all these has a role in protecting and conserving the beach.
- ✓ No physical solid structures such as walls should be constructed within the riparian zone of the beach.
- ✓ All construction activities should be limited to the official plot boundaries while ensuring that the prescribed riparian zone is not encroached nor disturbed in any way.

RESTRICTED BEACH ACCESS

The proposed project site is a beach plot, the frontage of the plot has white sandy beach that is clean and unpolluted. The beach is used by the general public, fisher folk and holiday makers. Previously, local community accessed the beach through a path that traverses through the proposed project site. Activities of the proposed beach development that may of concern as far as access to the beach is concerned may include: encroaching beach access route, blocking of beach access route, erecting of beach embankments and security guarding along the beach.

Encroaching beach access route

Beach access route is important in enabling the local community & general public in accessing the beach any time with ease. It is also important for the fisher folk to launch their boats into the deep waters and land the catch offloading off the waters with ease. The wider public can access the beach with ease through beach access route. Encroachment of beach access routes including the following;

- ✓ Physical blocking of the beach access route.
- ✓ Carrying out activities within the beach access route.
- ✓ Dumping of waste within the beach access route.
- ✓ Holding of construction materials tools and equipment within the beach access route.
- ✓ Erecting of temporally structures such as construction camp and material stores within the boundaries of the beach access route.

Blocking of beach access route

Blocking beach access route is a scenario where by an official beach access route is blocked and hence cannot be used for the intended purpose. A beach access route can be partially block or completely blocked, it can also be permanently blocked or temporally be blocked. Partial blocking of beach access may include using a section of the beach access for

other uses that are not in line with the intended use in such a scenario, only a certain section of the beach access is available for the intended use. Blocking of beach access on the other hand means totally obstructing the access route that no section of the route is available for the intended use. Temporally blocking of beach access is a scenario where by the blocking is for certain duration after which the access is cleared while permanent blocking is unending obstruction of the access route.

Erecting of beach embankments

Introduction of solid physical barriers along the beach frontage can contribute and result in restricting movements along the beach. During high tide manoeuvring along the beach because difficult especially when there is a wall constructed along the beach. In such a case free movement of beach users is curtailed. Restriction in beach movement from such structures is especially significant when,

- ✓ Such embankments are constructed within the riparian zone.
- ✓ Such embankments are solid in nature.
- ✓ When the 60-meter buffer above the high watermark is not observed.

Security guarding along the beach

Movement at the beach can be restricted not only by blocking access route but also by stationing security guards at the beach to guard tourists and their properties. In such a scenario local people's free movement in the beach will be restricted as the guards will deter them from freely moving along the beach in favour of tourists. Such a scenario can deprive local people their beach access rights.

POTENTIAL NEGATIVE IMPACTS OF RESTRICTED BEACH ACCESS

- ✓ Litigation issues as local people will be denied their constitutional right of accessing and using the beach.
- ✓ Restrained relationship between developer and local people.
- ✓ Denting the image of the investing company.
- ✓ Landing of fisher folk after fishing will become difficult especially during high tide.

SAFEGUARDS ON BEACH ACCESS

- ✓ A clear beach access route to be provided for to ensure that local people freely access the beach with no restrictions.
- ✓ The beach access should not be blocked in anyway.
- ✓ There should be no encroachment to the beach access.
- ✓ The beach access should not be put into any other use apart from that of access the beach.
- ✓ There should be no erection of any structures along the beach access route be they permanent or temporal at any time.
- ✓ Vegetation growth along the beach access should always be maintained to ensure the access is usable at all times.
- ✓ Erection of beach embankments should be discouraged.
- ✓ No development activity of any kind that should take place within the 60-meter riparian zone from the high watermark.
- ✓ Security guarding at the beach should not interfere with free movement of local people at the beach.
- ✓

SOLID WASTE FROM THE PROPOSED HOUSING DEVELOPMENT

Solid waste in considerable quantity is likely to be generated in two different phases. The first phase will be during site preparation stage while the second phase will be during operational phase of the project. Solid waste to be generated will include kitchen waste, waste paper and garden waste. Of these, kitchen waste will be of critical importance.

POTENTIAL ENVIRONMENTAL IMPACTS OF SOLID WASTE

- ✓ Poorly disposed waste paper especially plastic waste can block drainage.
- ✓ Poorly managed and disposed kitchen waste can attract disease vectors.
- ✓ Decomposing kitchen waste can pollute local ambient condition.

SAFEGUARD FOR SOLID WASTE POLLUTION

- ✓ Solid waste to be handled, managed and disposed according to the EMCA (Waste Management) Regulations, 2006.
- ✓ Sandy Shores apartments management to contract a NEMA licensed waste collection company disposal of solid waste.
- ✓ Solid waste to be collected regularly for disposal.
- ✓ Waste handling bins to be provided, each bin should have a lid which should always be covered.
- ✓ Colour code to be used to distinguish waste bins of different waste.
- ✓ Waste to be sorted at source.
- ✓ There should be no scattering of waste during transportation to disposal site.
- ✓ Solid waste to be disposed only at NEMA licensed disposal sites.
- ✓ In a case where kitchen waste is to be held for a day or more before disposal, then cold room facility to be provided for temporary handling to avoid decomposition.

SEWAGE FROM THE PROPOSED HOUSING DEVELOPMENT

Sewage will be generated the construction and operational phases of the housing project. During the construction phase, sewage will be generated from sanitary facilities of construction staff. During operational phase, sewage will be generated from sanitary facilities of the 184 housing units. The impact of sewage that will be generated in the two phases will depend on the sewage facilities that will be used, quantity of sewage that will be generated, handling and management of the sewage and how the sewage will be disposed. Currently the project proponent intends to handle all the effluent water generated from the development through septic tanks & exhaustion when full.

Preferred sewage management system

- ✓ The drawing provided in **annex 6** for the proposed sewage treatment system that will be used once the facility is in use.

Alternative sewage management system

Three other alternative sewage management design and or technologies are available namely KEE Nudisc treatment system, Biobox sewage treatment system and Klargesster Biodisc system.

The KEE NuDisc treatment system

The KEE NuDisc treatment system has a recycling element where all wastewater will be treated and recycled for reuse in toilets and irrigating lawns and flower gardens. The as KEE NuDisc treatment system has the following features: -

- ✓ The treatment system is carbonaceous, nitrification and nutrient removing.
- ✓ The system provides BOD (Biological Oxygen Demand) removal, nitrification and nutrient removal.
- ✓ The whole plant is contained in a grassfire reinforced polyester tank designed to a structural code for partial installation in the ground with only the cover showing up.
- ✓ The system consists of a primary settlement stage, sludge storage, organic and hydraulic balancing through anoxic stage, aerobic stage, and final settlement for removal of aerobic solids.

The Biobox sewage treatment system

Biobox Enpura is a complete waste water treatment system (typically known as a packaged plant), suitable for establishments producing from 2m³ up to 320m³ (320,000l) of sewage per day. A Biobox Enpura sewage treatment plant treats the effluent on-site and produces clear, odourless and environmentally safe water for the irrigation of shopping, sports fields, golf courses and agricultural plots – or for filling dams or simply to return it to the environment in streams, rivers or dams. The system is modular in design and can thus be replicated to meet increasing demands for treatment from 2m³ up to 320m³ (320,000l) per day if required. Biobox Enpura can treat both grey water (from laundries, baths, basins, kitchen sinks) and black water (toilet water). The waste water is gravity fed or pumped from the existing or new septic tank

The system involves pumping wastewater from source or septic tanks to a series of bioreactors; the effluent is then treated by means of aerated fixed film technology. Bacteria in the effluent lodge onto the film inside the bioreactors where they grow living on the nutrients in the effluent once they mature they die and the air scours off the film. The effluent then is passed through the clarifier where the sludge settles at the bottom and the clear water separates at the top. The clear water will be sterilised by means of contact chlorination system, ozone or alternative technology before discharge into the environment. The accumulated sludge at the bottom of the clarifier is recycled back into the septic tank where it is digested thus creating an ideal environment for the pre-digested raw sewage before entering the sewage treatment system.

Klargesster Biodisc system

The Klargesster biodisc system has five chambers through which the sewage moves and gets treated by use of microbial digesters. To ensure comprehensive sewage treatment and disposal capacity the system is designed to accept the full

water rate, biological load and 100% nominal flow to accommodate a maximum daily flow rate of 3.6m³ and a biological load of 1.08 Kg. A sludge-return pump is included within the unit to enhance performance and is configured to help overcome seasonal flow variations to ensure a consistent biomass during low-use or non-use periods. This type of sewage treatment technology produce a high quality treated wastewater that can be used for irrigation. Standard final effluent discharge is 20mg/l BOD, 30mg/l Suspended Solids (SS). Reduction of the BOD and SS to less than 10mg/l may be achieved using a pressurized sand filter or chemical dosing system. If required, an appropriate UV system may be installed to provide comprehensive effluent disinfection.

POTENTIAL NEGATIVE IMPACTS OF USING (THE PREFERRED SEWAGE SYSTEM) SEPTIC TANKS AND EXHAUSTION

- ⇒ **Contaminations of local groundwater resources;** the main environmental concern in regard to using septic tanks and soak pit to manage and dispose sewage is contamination of ground water resources in the area. Sewage in the soak pit can potentially soak and filter through the soil up to the water table. Considering that the rock type at the proposed project site is mainly coral limestone that is highly porous and chances that ground water may be contaminated are high.
- ⇒ **Contamination of local soils;** as the sewage and wastewater in soak pits soak and filter into local soil, this may result in pollution of local soils. The pollution may especially be of concern if wastewater from kitchen and laundry contains heavy metals which can be a result of using of chemicals and detergent in laundry work, cleaning and disinfection of floors. Such heavy metals can accumulate and find their way into the local soils this will potentially pollute local soils.
- ⇒ **Pollution of local air;** Air pollution can result from a number of reasons including loose covers (not airtight) of manholes and inspection chambers along the sewage line that will emit odour, burst sewage line, loose covers of septic tank and soakage pit that are not airtight that will emit odour and other awful gaseous smell into the atmosphere will potential pollute local air.
- ⇒ **Disposing of sewage into the environment before treatment;** Environmental pollution can also result if sewage and wastewater from the 184 housing unit's sanitary facilities is disposed into the environment before treated to stipulate standards as outline in the fourth schedule of the Environmental Management and Coordination (Water Quality) Regulations 2006.

ADDITIONAL SAFEGUARD FOR LIQUID EFFLUENT

Potential negative impacts likely to arise from use of soakage pits and septic tanks to manage sewage from the proposed apartment units may be mitigated in the following ways: -

1. All sewage (regardless of what system that will be in place) to be first treated as provided for in the fourth schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 before discharge into the environment;
2. Management to apply for effluent discharge license as provided for in the Environmental Management and Coordination (Water Quality) Regulations, 2006;
3. Effluent treatment system must be regularly maintained;
4. Manhole covers and those of inspection chambers, soak pit and septic tanks to always be tightly fastened (air tight) to avoid escape and release of odour;
5. Regularly check the sewage line for blockage and bursts for prompt repair;
6. Regular monitoring of local ground water to be done to ensure that no contamination occurs;
7. Ensure only NEMA licensed company exhausts the sludge from the waste water treatment plant;
8. Ensure the vehicle used to carry exhausted sewage is NEMA registered;
9. Ensure that once exhausted the sewage is disposed at a NEMA licensed facility for sewage management and disposal.

INCREASED DEMAND FOR WATER AND ELECTRICITY SUPPLY TO THE AREA

Increase in demand for water and electricity is likely to be experienced once the proposed housing development begins to be implemented. Demand for water will be for construction of the project and water to be used during operation of the housing units. As opposed to demand for water, rise in electricity demand will be experienced once the project is complete and operational.

Water sources

The project proponent has three possible alternatives that can be exploited to meet the required demand for water. These are (in order of priority): water supplied by the Kilifi Malindi Water and Sewage company; harness local ground water resources by sinking a borehole; and rain water harvesting.

Potential environmental impacts that could result from increase in demand of water and electricity

- ✓ Increased water rationing to the area from Kilifi/ Malindi Water and Sewage Company supply line.
- ✓ More boreholes likely to be drilled in the area which will exert pressure on local ground water resources.
- ✓ Increased power supply rationing to the area from national grid.
- ✓ Increased use of diesel power generators.
- ✓ Diversification into the use of alternative energy source as solar and wind energy will be experienced.

Proposed safeguards for public utilities

1. Approximate volumes of water to be required during construction of the proposed housing development to be computed in order to put in place mechanisms of reliable supply;
2. Water saving devices such as push taps to be installed to minimize lose through leaking taps;
3. Sinking of borehole to be done after obtaining clearance and licensing from WRA;
4. Energy efficient fixtures to be used in lighting throughout the entire development;
5. Generator to be installed to be automatic to safe on fuel consumption when there is electricity from national grid;
6. Electricity to be used in heating and warming to be mainly solar;
7. Solar/Wind energy to be harnessed and used in pumping water, heating and security lighting

WATER DEMAND AND USAGE

Water use in the facilities will be in the following areas: food preparation, cleaning and sanitation, sanitary facilities. Water use for food preparation will be for food cleaning and cooking. Water use for sanitary purposes is mainly cleaning of floors and sanitary facilities. Water demand for these activities will depend on occupancy of housing units. The bulk of the water will go to food preparation and sanitation. Presumed sources of water for the project are mainly: municipal supply and borehole water. The county government of Kilifi water supply in Kikambala area will be supplemented by ground water resources through a borehole that is to be drilled on site to meet the shortfall. annex 8 gives the hydrological survey for the surveyed borehole.

Potential negative environmental impact of increased water use

- ✓ The need to sink a borehole, this will increase the density of boreholes in the area.
- ✓ Increased abstraction of ground water to meet demand may result in over abstraction which will strain local water table.
- ✓ Increase competition for ground water as the number of users in the locality increase.
- ✓ Change in ground water quality overtime due to salt water intrusion.

ENERGY DEMAND AND USE

Energy demand for the facilities will be for lighting, heating, and cooling. Anticipated energy sources will be national grid supply from KPLC, standby generator and Liquid petroleum gas (LPG). Demand for energy use will depend on:

- ✓ prevailing weather- when it is hot, more energy will be required in cold room, freezers and air conditioning systems in the restaurant and bar as opposed to when it is cool.
- ✓ Occupancy of - the higher the activity in the restaurant and bar the higher the energy demand; and
- Source of water supply to kitchen, restaurant and bar- borehole water supply will require pumping to the rooms as opposed to municipal supply.

Sources of electricity

Just like in the case of water sources, there are three possible sources of electricity that the project proponent intends to exploit. These are:

- ✓ First priority is to source electricity from the national grid.
- ✓ Second priority will be installing power generators.
- ✓ Thirdly will be harnessing solar energy.
- ✓ Electricity from the national grid will be the main supply of electricity.

In case of shortage there will be standby generator. Solar energy will be used for heating purposes.

POTENTIAL NEGATIVE IMPACTS OF ENERGY DEMAND AND USE

- ✓ Increase in energy use in the area will increase the peak demand of energy in the area. This might result to shortage and in extreme case to power rationing.
- ✓ The use of diesel powered generator as standby power will result in generation of combustion emissions. The emissions are composed of greenhouse gases and thus long operation hours of the emergency generator will result in the higher greenhouse gas emissions.
- ✓ Reliability of energy supply is essential in the kitchen restaurant and bar due to voltage sensitive equipment such as freezers and air conditioning systems in the kitchen, restaurant and bar. Increased energy demand might trigger power outages that would damage some of this equipment resulting in food spoilage.

DUST NUISANCE

Dust is likely to be generated from the following activities/areas: ground excavation; delivery of building materials to site; and handling and mixing of cement.

Ground excavation-

Site preparation in readiness for construction work will require vegetation clearance stripping off of overburden material, ground leveling and compaction. These activities will open-up the ground to wind action and thus potentially resulting in dust generation. This is because vegetation clearance will directly expose the ground to agents of erosion, stripping off of overburden material will loosen soil aggregates thus making them easily susceptible to wind action; while removal of tree stumps and roots will weaken soil bounding and thus can easily be blown by wind

Delivery of building materials to site

Construction materials such as building blocks, cement, sand, steel bars, ballast will be bulky and thus will require to be delivered on site by a fleet of trucks driving in and out of the construction site. During this exercise dust is likely to be generated from: handling of cement which is dusty by nature of the way it is; handling of ballast which could contain loose

dust particles; site clearing of area of holding ballast, building blocks and sand will expose the site to win action; handling of building blocks especially coral limestone blocks can be a source of dust.

Handling and mixing of cement

The powdery nature of cement will be a potential source of dust especially during handling and mixing it with other materials such as sand and gravel. Cement dust will likely be of concern during: - opening-up of cement bags and emptying the cement in order to mix with other construction material; and during loading and offloading of cement.

POTENTIAL ENVIRONMENTAL IMPACTS OF DUST

Dust produced will potentially negative effect on employees, general public; and vegetation.

Effects of dust to employees

- ✓ Eye irritation.
- ✓ Skin irritation.
- ✓ Impairment of normal sweating of the skin as it blocks pores on the skin.
- ✓ Chocking of the throat.
- ✓ Respiratory difficulties.
- ✓ Difficulty in breathing.
- ✓ Potential course of chest complication and ailment

Dust impacts to immediate neighbours and general public

- ✓ Reduced visibility; emission of high particulate matter to the environment will reduce local visibility.
- ✓ Continuous exposure of people to dust will likely affect one's eye sight that can potentially result in an outbreak of eye infection.
- ✓ Chest related ailment; continuous exposure of people to dust will likely result in chest complications and respiratory disorders.
- ✓

Dust impacts to vegetation

- ✓ Dust settling on plant leaf surface will block leave stoma hence interfering with normal respiration of the plants.
- ✓ Dust settling on plants will reduce the evapo-transpiration of plants.
- ✓ Animals such as butterflies, caterpillars, grasshoppers who feed of foliage will be affected as the dust settled on foliage will render the foliage unpalatable.
- ✓ Heavy dust settling on plant matter will impair on normal growth of the plant.
- ✓ Heavy dust settled on plants will choke and kill plants.

SAFEGUARDS AGAINST DUST NUISANCE

The following measures can be put in place to mitigate possible negative impacts of dust that can result from implementation of the proposed housing project.

1. Regular sprinkling of water to be done on open surface and dust grounds until paving is done;
2. Selective cutting of trees in the site should be carried out. Only trees which are on exact proposed position of the buildings should be cleared any other vegetation outside proposed building position should be maintained;
3. Any open area should be planted with appropriate trees, flowers and grasses;
4. Project management and contractor to enforce strict use of personal protective clothing;
5. Complains of dust related ailments among employees and neighbors to be given access to medical attention.

NOISE NUISANCE

Noise is likely to be generated from the following activities/areas:

- ✓ During ground preparation.
- ✓ During assembly of building materials on site.
- ✓ During construction of the housing development.

A brief elaboration of each of the potential source/cause of noise is as follows: -

Ground preparation

Ground preparation is another activity that will potentially result in noise nuisance. Activities of ground preparation that are likely to result in noise nuisance include;

- ✓ Cutting of large trees on site to pave way for construct work. Some trees on site are large if they will be cut then a power saw must be used. The use of power saw will course noise nuisance.
- ✓ Use of heavy machinery such as excavators, caterpillars in ground excavation will be a source of noise nuisance.
- ✓ Transportation of excavated earth material from site by use of dump trucks will result in noise nuisance. The noise will be mainly from the trucks.

Assembly of building materials

Building materials to be used in construct site will first be gathered and assembled on site. These include building blocks, timber, steel bars, sand, gravel cement. Possible courses of noise nuisance when assembling construction material on site include;

- ✓ Offloading of building materials on site especially steel bars, gravel and building blocks can result in noise.
- ✓ Trucks ferrying in building materials can be a source of noise.
- ✓ Employees involved in offloading of building material can be a source of noise.

Construction of the proposed housing development

Construction of the Sandy Shores apartment units will be labour intensive. This will involve engaging a large workforce, also during construction some machines and equipment will be in use. Possible sources of noise during construction work may include: loud talking, shouting and conversation among employees; noise from equipment such as cement mixers; noise from machines such as welding machines and wood working machines; increased machine and equipment activity on site.

POTENTIAL ENVIRONMENTAL IMPACTS OF NOISE

Impacts of noise will potentially affect the immediate neighbors; and employees.

Impacts of noise to immediate neighbours

- ✓ Noise nuisance especially from power saw, excavators, cement mixer, may be a nuisance to immediate neighbors.
- ✓ Continuous exposure of neighbors to noise nuisance may result in noise induced hearing lose.
- ✓ Noise nuisance may reduce concentration of neighbors in their private matters.

Noise impacts to employees

- ✓ Noise nuisance especially from power saw, excavators, cement mixer, may impair oral communication among employees.
- ✓ High noise level will force employees to shout laud when communicating to one another.
- ✓ Exposure of employees to high noise level (above 85dB) continuous for 8hours per day may result in noise induced haring lose.
- ✓ Exposure of ear to peak sound level instantaneously may result to deafness.

PROPOSED NOISE SAFEGUARDS

The following measures can be put in place to mitigate possible negative impacts of noise that can result from implementation of the proposed Sandy Shores Apartments project.

1. Noise levels to be within the prescribed limits as stated in EMCA (Noise and Excessive vibration pollution control) Regulations, 2009.
2. All construction work to be limited to daytime only.
3. Immediate neighbors to be notified in writing on the date of commencement of construction work at least one month in advance.
4. All employees likely to be exposed to ear noise to be provide with ear protectors.
5. Contractor to ensure strict enforcement on user of ear protectors.
6. Where applicable and possible exceptionally noisy machines to be fitted with noise reduction devices.
7. Any employee who may complain about ear related pain and or complication while at work to access medical attention at the expense of the contractor or project proponent.
8. Where employees are likely to be exposed to continuous noise, management to organize for work to be done in four hour shift instead of eight-hour shift.
9. Noise equipment especially concrete mixer to be located as far away as possible from already built residence in the neighborhood.

VEGETATION LOSS

Impact of Vegetation Clearance

The proposed project will involve clearing of forms of vegetation on site. Vegetation plays vital role in soil conservation as they hold soil aggregate tight thus reducing soil erosion. They also shed their leave helping in the provision of nutrients to soil micro-organism which helps in the soil formation. Vegetation clearance also reduces soil erosion by wind and surface runoff. This phase will result in the removal of vegetation on site which is the trees, shrubs and hedges (see baseline conditions of the proposed project site). These can be converted into firewood by the few local residents once allowed to collect. Equally, they can be kept in a safe place where the owner of the land could use in bits as firewood. This activity is likely to lead to the reduction of tree cover as much of the vegetation of the proposed project site will have to be brought down to create space for the construction of the housing units and other auxiliary facilities. Cutting of the trees and vegetation removal will directly affect the flora in the proposed project site and in the area. Farther reduction in vegetation cover on site and by extension in the locality will potentially result in the following: -

- ✓ That vegetation gets cleared and that what emerges is a new built up environment that rarely contributes to the reduction of space for sinking carbon in the atmosphere.
- ✓ That an increased built up area increases the chances of reduction of the little available natural environments in that built up areas are alien to nature at most
- ✓ Exposing the ground to agents of erosion.
- ✓ Loss of important patching and roosting ground for birds and other fauna.
- ✓ Reduction on the capacity of area carbon sink.
- ✓ Open ground will be exposed to direct sun hence potentially increase soil moisture loss.
- ✓ Destruction of riparian vegetation. Riparian vegetation along the beach is of important ecological significance. Riparian vegetation along the beach plays an important role in beach conservation. This includes breaking of sea waves and hence encouraging deposition; riparian vegetation act as a sheltered place for nesting of marine organisms, riparian vegetation along the beach deter and prevent beach erosion.

MITIGATION MEASURES ON VEGETATION CLEARANCE

1. Along the periphery of the plots should not be cleared and the trees along the periphery to acts as wing breaks

2. More trees should be planted along the periphery of the land and more so on the lower end of the bordering the beach front. This will protect the beach from erosion.

INCREASE IN VEHICULAR TRAFFIC IN THE AREA

Increase in vehicular traffic in the area is likely to be experience during construction and operational phase of the proposed housing development. During the construction phase increase in vehicular traffic in the area is likely to be as a result of: -

- ✓ Trucks ferrying construction material to site.
- ✓ Trucks ferrying waste material from site.
- ✓ Ferrying in of construction tools and equipment.

During the operational phase of the Sandy Shores Apartments project, increase in vehicular traffic in the area is likely to result from: -

- ✓ Tenants and employees at the facility.
- ✓ Service provision vehicles such as garbage collection trucks.
- ✓ Vehicles belonging to tenants and visitors to the proposed housing development.

POTENTIAL NEGATIVE ENVIRONMENTAL IMPACTS LIKELY TO RESULT FROM INCREASED VEHICULAR TRAFFIC IN THE AREA

- ✓ Possible traffic congestion of local roads and lanes.
- ✓ Possibility of occasional experience of delays on the said local roads.
- ✓ Increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads.
- ✓ Cost of maintaining local roads will increase.
- ✓ Pedestrians and cyclists using local roads will have to exercise more care with increase of vehicular traffic on the said roads.
- ✓ There will be an increase of exhaust emission from vehicles which will pollute local atmospheric air.

SAFEGUARDS FOR VEHICULAR TRAFFIC IMPACTS

- ✓ The following measures can be put in place to mitigate possible negative impacts likely to result from increase in vehicular traffic in the area.
- ✓ Trucks ferrying materials, tools and equipment to the site to observe the set speed limits to avoid accidents.
- ✓ Trucks ferrying materials, tools and equipment to the site to observe the set axle maximum limit for the said roads.
- ✓ Management to provide for adequate internal parking.
- ✓ All users of said roads to always observe traffic rules this will give pedestrians and cyclist their space and safety while using the road.
- ✓ Marking of the roads to be clearly done.

9.ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

The Environmental and Social Management plan (ESMP) spells out the policies and specific action plans required to mitigate against the key negative impacts predicted in the preceding three chapters. The policies and action plans form the first section of the ESMP. The second section comprising of the environmental monitoring and decommissioning plans form the final components of the ESMP. The goal of the ESMP is to achieve an environmentally sound and sustainable project venture.

9.1 Policies

The analysis of the potential impacts of the proposed Sandy Shores Beach development have been done in the preceding three chapters. The management of the housing units will need to develop and document management policies that will guide operations of the facility. The policies are vital in that: they will enable management put in place measures and structures that will care for the safety, health and welfare of all facility users; they will ensure that management will plan for, and put in place, monitoring programmes that will ensure facility activities confirm to stipulated environmental standards; and they will ensure that management assumes its corporate responsibility for its activities with regard to conservation of the environment as well as for the well-being of the neighbouring community. The following policies will need to be developed: -

- a) Environmental Management Policy.
- b) Occupational Health and Safety Policy.

Environmental Management Policy

The environmental policy to be developed should be one that enables Bestbase Investment Ltd management carry out their activities with the highest regard to the natural environment and sustainable utilisation of environmental resources therein. The policy should therefore cover the following, among other issues;

1. Ensure that all project activities operate within legal requirements of all relevant national legislation.
2. That there will be continuous environmental improvement and performance through monitoring of facility activities.
3. Ensure that utilisation of natural resources is optimal with measures in place to ensure resource availability for future generation.
4. Awareness creation to the surrounding community regarding sustainable utilisation of natural resources, protection of sensitive ecosystems and bio-diversity maintenance; and
5. Balancing between natural resource use, environmental conservation and economic development.

Occupational Health and Safety Policy

The Occupational Health and Safety Policy to be developed for the proposed project should enable facility management put in place appropriate measures that will ensure that the health, safety and welfare of all facility users is cared for; together with the health requirements of the local community in which the facility is located. The policy should highlight on the following, among others: -

1. Medical examination of food handlers;

2. Sanitation in the facility;
3. Proper liquid and solid waste management and disposal;
4. Emergency preparedness;
5. Fire safety;
6. Safety measures for cold storage equipment;
7. Appropriate safety and rescue equipment to be availed to facility users;
8. Risk minimisation of accidental damage, community and environment; and
9. Training in safety and emergency preparedness for employees.

Before construction work begins site preparation will need to be undertaken, vegetation clearance and ground excavation. Other aspects of the project implementation phase that will require sound environmental planning include management of dust, noise and occupational hazards. During the operational phase of the project proper planning on the side of collection and disposal of solid waste and sewage will be required.

To address the above concerns there will be a need to entrench within the working operations of the proposed project a sound Environment & Social Management Plan (ESMP) that will ensure no environmental pollution occurs as a result of the proposed development. To achieve this following will need to be done: -

- ✓ The project proponent is to develop and document Environment & Social Management Policies that will guide construction work and other site operations during and after construction. The policies should address environmental conservation measures to be put in place, occupational and safety matters of constructing employees and management of sewage and other waste.
- ✓ The project proponent to avail necessary finance for implementation of ESMP.
- ✓ Contractors to ensure that they carry out their work within Environmental and Occupational, Health and Safety requirements.

This will ensure that management and project contractor will avail necessary finances to ensure necessary systems are put in place to address safety, health and welfare of all workers during construction and management of dust, noise, solid waste effluent and sewage from the project component.

This ESMP for the proposed Sandy Shores Beach development component of the project covers six management Plans that will need to be operationalized once project implementation begins.

The Management Plans are as follows: -

- Beach management plan.
- Sewage management plan.
- Solid waste management plan.
- Noise management plan.
- Dust management plan.
- Occupational Hazards Management Plan.

9.2 Beach Management Plan

9.2.1 Introduction

The objective of the Beach Management Plan (BMP) is to ensure that implementation of proposed project does not result in adverse negative impacts to the local beach. The BMP covers activities that if undertaken can result in beach pollution and or destruction. The BMP is to be achieved by continuous monitoring of all activities on site, implementation of recommendations and mitigation measures made in this report in respect to beach management pollution prevention and ensuring the conditions subjected to licence approval with respect to beach management are adhered to.

9.2.3 Enforcement

The BMP guiding principle will be continuous and sustained improvement in site construction work and associated activities, safety and environmental performance, supported by regular feedback from neighbours and general public through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, the Marine Officer NEMA, County Environmental Director Kilifi & KWS will be enjoined in actions taken.

9.3.4 Background

Activities of the proposed beach development that may result in beach pollution and or destruction may include disposing of construction liquid and solid waste within the riparian vegetation, cutting and removal of riparian vegetation from the riparian zone, physical removal of beach sand from the beach and introduction of solid physical barriers along the beach frontage. Each of these issues has been elaborate in depth in the impact assessment section.

Table 4Beach Management Action Plan

Activity/issue/ concern	Potential Environmental Impacts	Proposed Mitigation measures	Monitoring	Actors	Timeframe	Cost Estimates (Ksh)
Disposing of construction waste within the riparian vegetation	<ul style="list-style-type: none"> ➤ Destruction of riparian vegetation within the riparian zone. ➤ Contamination of the riparian vegetation and environment. ➤ Death of plant and animal life within the riparian zone. ➤ Contamination of soils within the riparian zone. 	<ol style="list-style-type: none"> 1. All solid waste to be collected handled, managed and disposed according to the Environmental Management and Coordination (Waste Management) Regulations, 2006. 2. All liquid waste to be collected handled, managed and disposed according to the Environmental Management and Coordination (Water Quality) Regulations, 2006. 3. No disposal of any solid or liquid waste within the riparian vegetation of the wider beach environment. 4. Waste receptacles to be provided at the proposed project site for dropping of waste. 5. NEMA registered waste collection and Disposal Company to be hired to collect and dispose all waste generated from the proposed construction site and dispose the collected waste to NEMA licensed disposal sites. 6. Vehicles that will be used to collect solid waste from the proposed construction site for disposal must be licensed by NEMA. 7. All liquid waste generated on site should be collected in mobile tankers and later disposed to a NEMA licensed wastewater recycling facility on a continuous basis until the wastewater recycling facility on site is constructed and operational. 8. Organise regular beach cleaning activities. 	<ul style="list-style-type: none"> ▪ Records of quantity of solid and liquid wastes generated and disposed. ▪ Tracking documents from waste collectors and disposers. ▪ Intactness of the riparian vegetation. ▪ Animal life within the riparian vegetation. 	<ul style="list-style-type: none"> ○ Project proponent. ○ Project contractor. ○ Local community. ○ NEMA ○ Kilifi County Gov ○ Public Health. ○ General public. 	<ul style="list-style-type: none"> • Before implementation of the project all proposed measures should be first be in place. • All the measures should be continually observed and improved on throughout the construction period, implementation period and decommissioning period. 	500,000 pa.
Cutting and removal of riparian vegetation from the riparian zone	<ul style="list-style-type: none"> ➤ Beach erosion. ➤ Destruction of spawning ground for marine life. ➤ Destruction of flora and fauna. ➤ Destruction of local aesthetics. 	<ol style="list-style-type: none"> 9. There should be no cutting of any vegetation within the riparian zone. 10. Observe 60 meter riparian reserve from the high watermark within which no development of any kind should be done. 	<ul style="list-style-type: none"> ▪ Monitoring the intactness of the riparian vegetation. ▪ Inventory of plants within the riparian zone. 	<ul style="list-style-type: none"> ○ Project proponent. ○ Project contractor. ○ Local community. ○ NEMA ○ Kilifi County Council ○ General public. 	<ul style="list-style-type: none"> • Before implementation of the project all proposed measures should be first be in place. • All the measures should be continually 	50,000 per year

Activity/issue/ concern	Potential Environmental Impacts	Proposed Mitigation measures	Monitoring	Actors	Timeframe	Cost Estimates (Ksh)
					observed and improved on throughout the construction period, implementation period and decommissioning period	
Physical removal of beach sand from the beach	<ul style="list-style-type: none"> ➤ Loss of beach sand. ➤ Beach habitat for marine organisms will be destroyed. ➤ Destruction of off sea marine environment. ➤ Beautiful beach aesthetics will be lost. 	<p>11. No removal of any beach sandy for construction work or any other use.</p> <p>12. No cutting or removal of any riparian vegetation or any dead or dry vegetation matter from the riparian zone as all these have a role in protecting and conserving the beach.</p> <p>13. No physical solid structures such as walls should be constructed within the riparian zone of the beach.</p>	<ul style="list-style-type: none"> ❑ Monitoring sand deposition rate at the beach. ❑ Monitoring of any beach erosion. ❑ Monitoring sources of sand used for construction for all beach developments. 	<ul style="list-style-type: none"> ○ Project proponent. ○ Project contractor. ○ Local community. ○ NEMA ○ Kilifi County Council ○ General public. 	<ul style="list-style-type: none"> ● Before implementation of the project all proposed measures should be first be in place. ● All the measures should be continually observed and improved on throughout the construction period, implementation period and decommissioning period 	100,000 per year
Introduction of solid physical barriers along the beach frontage	<ul style="list-style-type: none"> ✓ Will contribute and result in erosion of the beach and beach environment. ✓ Interference with the free flow of ocean water during low and high tide. ✓ Reduction in beach sand deposition. 	<p>14. No physical solid structures such as walls should be constructed within the 60 meter riparian zone of the beach.</p>	<ul style="list-style-type: none"> ❑ Physical checking to ensure 60 meter riparian reserve is observed and protected. 	<ul style="list-style-type: none"> ○ Project proponent. ○ Project contractor. ○ Local community. ○ NEMA ○ Kilifi County Council. 	<ul style="list-style-type: none"> ● Before implementation of the project all proposed measures should be first be in place. ● All the measures should be 	100,000 per year

Activity/issue/ concern	Potential Environmental Impacts	Proposed Mitigation measures	Monitoring	Actors	Timeframe	Cost Estimates (Ksh)
	<ul style="list-style-type: none"> ✓ Interfere with free movement along the beach especially during high tide. 			<ul style="list-style-type: none"> ○ General public. 	continually observed and improved on throughout the construction period, implementation period and decommissioning period	

9.3 Sewage Management Plan

9.3.1 Introduction

The objective of the Sewage Management Plan (SMP) is to ensure that sewage from the proposed apartment units does not result in environmental pollution. The SMP is to be achieved by continuous monitoring and management of sewage from the housing units, implementation of recommendations and mitigation measures made in this report in respect to sewage management and ensuring the conditions subjected to license approval with respect to sewage management are adhered to.

9.3.2 Enforcement

The SMP guiding principle will be continuous and sustained improvement in management and disposal of sewage from the housing units, environmental performance, supported by regular feedback from neighbours and general public through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, the Kilifi Water and Sewage Company, County Public Health Officer and County Environment Officer, Kilifi will be enjoined in actions taken. This will include giving them access to inspect sewage system in use and give government directives as provided for in the law.

9.3.3 Background

Management and disposal of sewage from the housing units will be crucial. This is because in Kikambala there is no functional public sewer system. Bestbase Investment Ltd has two options to choose from as far as sewage management and disposal is concerned.

- ✓ Option one is using septic tanks and soak pits.
- ✓ Option two is to incorporate a sewage treatment facility.

Use of septic tanks and soak pits

Septic tanks and soak pits have the following advantages: -

- ✓ They are relatively easy to construct.
- ✓ Utilize underground space thus leaving above ground for other use.
- ✓ Does not alter the physical look of a place as tanks are underground.
- ✓ In the short term they are relatively cheaper from the economic point of view.
- ✓ Require minimal servicing and maintenance.

Septic tanks and soak pits if used will have the following disadvantages: -

- ✓ They are expensive in the long term considering periodic cost of exhausting and emptying.
- ✓ They easily result in pollution of ground water resources and soils in the locality.
- ✓ Contents especially those in soak pits can filter into the sea thus potentially polluting the sea.
- ✓ If not promptly exhausted they can be a potential course of an epidemic when filled.

Sewage treatment facility

The second option is Bestbase Investment Ltd to construct a sewage treatment facility to manage all sewage from the housing units. Just like in the first option, this option too has its advantages and disadvantages.

Advantages of using a sewage treatment facility to manage sewage include: -

- ✓ It is cost-effective in the long term.
- ✓ If the treatment of wastewater is adequately done, the treated wastewater can be reused in irrigating gardens thus reducing the overall volume of water required.

- ✓ Microbial digesters can be used to digest sludge which is environmental friendly the sludge can later be reused.
- ✓ Large volumes of sewage can be handled with ease.
- ✓ Depending on the design of the plant minimal space is required.
- ✓ Sludge can be dried and used in gardens.

Disadvantages of a sewage treatment plant may include: -

- ✓ Initial investment cost is relatively high.
- ✓ Technically competent personnel are required to run and manage the plant.
- ✓ If sewage plant does not function as required, it can result in a total crisis as there will be no treatment of the sewage.
- ✓ It requires a back-up system just in case the main system fails.

Potential Environmental Impacts	Proposed mitigation measures	Environmental surveillance	Responsibility	Timing	Cost estimate (Ksh)
SEWAGE handling					
Contamination of ground water resources	<ol style="list-style-type: none"> 1. -Effective treatment of the sewage to be done before discharge to the environment; 2. -Ensure Biological Oxygen Demand (BOD) of the sewage is 30mg/l or less before discharge to environment. -Ensure Carbon Oxygen Demand of the sewage is 50mg/l. or less before discharge to environment. 	<ul style="list-style-type: none"> -Monitoring of BOD and COD every three months -Monitoring of quality of ground water resources in the neighborhood by periodically sampling and testing borehole water 	Project proponent. Kilifi Water and Sewage Company, County Environmental Officer. County Public Health Officer	Once the housing units are in use. Then throughout the life span of the housing units	100,000
Contamination of local soils	<ol style="list-style-type: none"> 3. -Sludge generated to be first tested for any contaminants before disposal. 4. - Local soils to be tested periodically for presence of pollutants emanating from the sewage system 	<ul style="list-style-type: none"> -Testing sludge for presence of contaminants -Testing local soils from site for presence of contaminants. 	Project proponent. Kilifi Water and Sewage Company, County Environmental Officer. County Public Health Officer	Once the housing units are in use. Then throughout the life span of the housing units	100,000
Adour/ awful smell to neighbors and general public	<ol style="list-style-type: none"> 5. -Prompt repair and maintenance of bursts and leakages; 6. -Effective aeration to be done; 7. - Microbial activity to be enhanced to fasten digestion and breakdown of sewage contents 	<ul style="list-style-type: none"> -Constant monitoring of microbial activity in treatment ponds - Constant monitoring of amount of dissolved oxygen in the ponds/ retention tanks 	Project proponent. Kilifi Water and Sewage Company, County Environmental Officer. County Public Health Officer	Once the housing units are in use. & throughout the life span of the housing units	100,000

9.4 Solid Waste Management Plan

Solid waste will start to be generated from the onset of construction work of the proposed development. The clearing of the vegetation on site, excavation of soil and construction material packaging such as cement bags, wooden crates and paper cartons containing furnishings and fittings for the proposed housing units and will be generated. Once the entire development is completed and fully operational, solid waste likely to be generated includes: plastics, glass bottles, grass and flower cuttings from the gardens, food left-overs from the kitchen, aluminium cans, papers, and worn out linens from the kitchens. Quantity of each of these waste stream waste will depend on the number of the facilities at any one given time. It is recommended that management of Sandy Shores Apartments put in place a sound waste collection, handling and disposal system by: -

- ✓ Sorting of waste at source will ensure separation of food based waste from paper waste, plastic waste and other wastes.
- ✓ Placing well labelled bins at strategic locations of the housing blocks to encourage recycling and sorting of recyclable waste.
- ✓ Provision of special bins to segregated and handle hazardous.
- ✓ Contracting of a NEMA licensed waste collection and disposal company to collect and dispose/ recycle all solid waste from the facility on a regular basis.
- ✓ Composting of organic waste such as garden waste.
- ✓ Prohibiting burning of dry/garden waste in the open. If burning has to be done then it should be in an incinerator.

9.4.1 Objective

The measures and recommendation should be put in place with the objective of ensuring that handling, management and disposal of solid waste from the entire development does not result in environmental pollution. Continuous monitoring of waste disposal practice from the facility, implementation of recommendations and mitigation measures made in this report with respect to disposal of solid waste and ensuring that conditions subjected to EIA license approval with respect to solid waste management and disposal are adhered to can achieve this.

9.4.2 Enforcement

The solid waste management plan will be enforced by Bestbase Investment Ltd, relevant local government departments and lead Agencies by continuous monitoring, consultation and feedback from, neighbors and the general public. This will be used as a basis for improvement on environmental performance of the facility. To ensure adherence to the set conditions, The CGK , Public Health Officer and County Environment Officer, Kilifi will be enjoined in actions taken.

Table 5 Solid Waste Management action plan

Potential environmental impact	Proposed mitigation measure	Environmental surveillance	Responsibility	Timing	Cost estimate (Ksh)
SOLID WASTE HANDLING & DISPOSAL					
Construction waste generating dust & visual pollution	1. -All excavated top soil to be stockpiled for landscaping work a. Excavated rocks, cleared vegetation and construction debris to be dumped at officially designated dump site.	-Record of tonnage moved by the waste contractor	Project contractor, NEMA licensed waste contractor, mngt	During construction works	Part of contractor's cost.
Blockage of drainage	2. All drainages to have covers 3. Labelled & colour coded waste bins to be provided at strategic points of the entire development. 4. -Hazardous waste bins that are leak proof to be set in the lab section of the project. 5. - Prompt collection & disposal of generated solid waste by NEMA certified company	-There should be no waste scattered in storm water drainages; -There should be record of waste collection from the proposed Bestbase Investment Ltd- housing units & disposal by licensed company	mngt, Public Health Officer & County Environmental Officer	Before start of operations at the facility	70, 000 for waste receptacles
Attraction of disease-causing vectors	6. A cold room for handling rapidly decomposing waste such as food left offers to be provided for in the restaurant kitchen. 7. All waste bins to be emptied daily. 8. All waste bins to have lids on. 9. Regular emptying of grease traps 10. -Regular fumigation of waste storage locations with environmentally neutral chemicals	-Monitoring of presence of disease causing vectors such as flies in the area. -Fumigation records, chemical used & material safety data sheets	mngt, PHO & CDE	From onset of facility operations up to decommissioning.	50, 000 p.m. for waste removal
Littering & scattering	11. Regular beach cleanup 12. -Posting of signs to encourage responsible waste disposal. 13. -Waste collection company to ensure there is no littering and scattering of waste during collection and transportation.	-Record of solid waste collection of waste from entire facility	EHS officer, PHO & CDE	From onset of facility operations up to decommissioning.	40, 000 for sound solid waste mngt campaign

9.ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

Potential environmental impact	Proposed mitigation measure	Environmental surveillance	Responsibility	Timing	Cost estimate (Ksh)
SOLID WASTE HANDLING & DISPOSAL					
Awful smell	14. -All waste bins to have lids on always. 15. -Temporally cold waste handling facility for rapidly composing waste to be provided.	-Tally of waster receptacles -Adequacy of cold storage temperature to handle organic waste	EHS officer, PHO & CDE	From onset of facility operations up to decommissioning.	Budget allocated above
Hazardous wastes	16. -Oil rugs, filters, batteries and burnt out mercury lamps to be segregated and handled as hazardous waste. 17. -Appropriate waste contractor with experience in handling hazardous waste to be contracted	-Records of each hazardous waste stream handled. -Record of method of disposal.	EHS officer, PHO & CDE	From onset of facility operations up to decommissioning.	100,000 p.m. for hazardous waste disposal

9.5 Dust Management Plan

9.5.1 Objective

The objective of the Dust Management Plan (DMP) is to ensure that site clearance, ground excavation and removal of vegetation cover, loading and offloading of building materials and mixing of cement, ballast and other additives and earth moving machine activity on site does not generate and or result in emission of significant quantities of dust to the environment. The DMP take into critical look at possible construction activities that can result in emission of high amounts of dust to the atmosphere thus polluting the air. This is to be achieved by continuous monitoring of air quality on site, suspended particulate matter, implementation of recommendations and mitigation measures made in this report in respect to dust pollution and ensuring the conditions subjected to EIA license approval with respect to dust management are adhered to.

During the construction phase of all the proposed project, dust is likely to be a major nuisance to employees working on site, neighbors and the general public if adequate steps are not taken by the contractor to suppress dust. Elements of the proposed development likely to generate dust are; ground excavations on site; loading of overburden material and transportation to disposal site. As opposed to this restricted movement of machines, use of dust screens, provision and use of dust masks, sprinkling of water on dusty grounds and selective vegetation clearing will significantly reduce dust pollution. Each of this is briefly outlined below.

- ✓ **Machine activity on Site** -Construction work will spur numerous activities on site. This will include increased machine activity and movement on site. This will result in dust pollution.
- ✓ **Loading and offloading of building materials**-Before commencement of construction work, all required construction materials should be assembled on site. This process will involve loading and offloading of the materials from site of origin and to construction site respectively. Loading and offloading of building materials such as ballast, gravel, concrete and cement may result in dust pollution
- ✓ **Mixing of cement, ballast and other additives**- Preparation of construction material will involve mixing of cement, sand, ballast and other additive. The process of adding cement to these other materials may result in dust pollution.

To reduce the effect and amounts of dust generated the following are practical;

- ✓ **Dust screens**- Use of dust screens at construction site will significantly help to trap and filter most of dust produced. This will involve securing construction site with dust screens that will trap dust before it escapes to the environment. The finer the dust screens the more effective they will be in trapping dust and thus the less the dust is likely to find its way into the environment.
- ✓ **Provision and use of dust masks**- Employees at construction site are directly exposed to dust. Provision of dust masks by contractor and the effective use of the dust masks will significantly reduce dust impacts to the employees. Each employee should be provided with a new dust mask every morning before commencement of work. Used dusk masks must be disposed off at end of working shift. Use of dust masks will reduce inhalation of dust by employees involved in construction work.
- ✓ **Sprinkling of water on dusty grounds**- One way of arresting dust will be by sprinkling water. This method will be effective in arresting dust from open excavated ground and earth roads. Water sprinkling will be done during dry spells at least twice a day in the morning and afternoon.
- ✓ **Restricted machine movement**- To avoid generation of much dust to the atmosphere, machine activity to be restricted to specific construction site.
- ✓ **Selective vegetation clearing**- Vegetation on site acts as wind break thus reducing wind speed. Wind is an agent of erosion, which can result in dust. During project implementation selective vegetation clearance

will be done. Trees within area to be constructed will be the only ones to be cut. Efforts should be made to try to preserve as many trees already on site as possible.

9.5.2 Enforcement

The DMP guiding principle will be continuous and sustained improvement in site construction activities, safety and environmental performance, supported by regular feedback from all neighbors and stakeholders through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, The County Occupational Health and Safety Officer, Kilifi, County Environment Officer, Kilifi and the County Public Health Officer, Kilifi will be enjoined in actions taken. This will include giving them unlimited access to construction site to assess working conditions as far as dust is concerned and give advice and government directives as may be deemed appropriate.

Table 6 Dust Management action plan

Potential environmental impacts	Proposed mitigation measures	Surveillance	Responsibility	Timing	Cost estimates (Ksh)
DUST NUISANCE & POLLUTION					
Ground excavation and removal of vegetation cover exposing of ground to agents of erosion -Dust pollution employees on site, immediate neighbours & general public	<ol style="list-style-type: none"> 1. Ensure only exact site where houses will stand to be excavated 2. Sprinkle water on dusty ground twice a day during dry spell; 3. -Provide employees with dust masks; 4. - Encourage vegetation growth on open areas. 	Records of number of trees planted on site; periodic sampling of particulate matter from site	mngt, project contractors & government (CDE & DOHSO)	At onset of project implementation.	100,000 for tree planting, water sprinkling & particulate matter sampling, testing & analysis.
Loading and offloading of building materials	<ol style="list-style-type: none"> 5. -Provide personal protective (PPE) clothing to each employee 6. -Ensure effective use of protective by all employees 7. -Secure loading and offloading zone with dust screens 	Periodic sampling of particulate matter from site	mngt, project contractors & government (CDE & DOHSO)	At onset of the project & throughout project implementation period.	130,000 for dust screens and PPE
-Mixing of cement, ballast & other additives	<ol style="list-style-type: none"> 8. Provide personal protective (PPE) clothing to each employee 9. - Ensure effective PPE by all employees 	Periodic sampling of particulate matter from site	-mngt, project contractors & government (CDE & DOHSO)	At onset of the project & throughout project implementation period.	90,000 for PPE

9.6 Noise Management Plan

9.6.1 Introduction

Elements of operation during the implementation of the housing project that are likely to result in noise pollution are routine use of machinery, presence of large human labour force and actual construction work. As opposed to this use of machines with inbuilt mechanism to reduce noise (silencers) and employees observing silence at construction site will reduce noise pollution. Each of these issues is briefly explained below.

- ✓ **Routine use of machinery-** Heavy earth moving equipment such as bulldozers, excavators, loaders, dump trucks and cranes to be used in site preparation, loading, transportation and delivery of material to site and the actual construction work can be a source of noise. Routine machine use and movement of machine on site can produce much noise. Use of heavy machine in building and fabrication work such as cranes, grinding, welding machines will result in significant noise.
- ✓ **Actual construction work-** Construction work will spur much activity on site. This will attract use of heavy machinery. There will be regular movement of machines and vehicles on site. Machine movement and activity will likely result in noise.
- ✓ **Human labour force-** Construction work will be labour intensive. Presence of large labour force on site will spur human interaction and activity that will likely generate noise. Casuals at construction site engage a lot in talking as they undertake their assignments. This can be a source of noise.
- ✓ **Silencers-** Some machines have inbuilt mechanisms that ensure that when in use they do not produce much noise. Some of these mechanisms include silencers. Other machines have options of fitting noise reduction devices. Use of machines with this technology at site will significantly reduce noise pollution.
- ✓ **Observing silence-** Employees on site especially casuals can be asked to always observe silence while at work. Observing silence by all employees while at site will contribute in reducing possible noise pollution to nearby neighbours and general public.
- ✓ **Emergency generator sets operation-** During the operational phase of the project, the management will install a diesel powered emergency generator to counter power outages from the national grid. The operation of the generator will generate noise. Citing of the generators will also impact the extent to which the noise generated will be a nuisance to neighbours and guests at the facility. A soundproof canopy is therefore recommended to reduce this noise associated with the operation of these diesel generators.

9.6.2 Enforcement

The NMP guiding principle will be continuous and sustained improvement in site construction work and associated activities, safety and environmental performance, supported by regular feedback from neighbors and general public through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, The County Occupational Health and Safety Officer, Kilifi, County Environment Officer, Kilifi and the County Public Health Officer, Kilifi will be enjoined in actions taken. This will include giving them unlimited access to construction site to assess working conditions as far as noise is concerned and give government directives as provided for in the law.

Table 7 Noise Management Action Plans

Potential Environmental Impacts	Proposed Mitigation measures	Environmental surveillance	Responsibility	Timing	Cost estimates (Ksh)
NOISE NUISANCE & POLLUTION					
-Routine use of machinery resulting in noise disturbance & pollution to employees & workers	<ol style="list-style-type: none"> 1. Noisy machines to be fitted with silencers 2. Undertake a noise survey for the work place to determine appropriate noise mitigation strategies 3. -Limit number of employees & duration of exposure to noise above statutory noise limit. 4. -Provide employees exposed to above statutory noise limits with ear protectors 	Record of noise survey at the project site when construction is on & also when need arises especially if there will be noise related complains.	mngt, project contractors, & COHSO Kilifi	From onset of construction work until completion	50,000 for noise survey 60,000 for noise mitigation devices
Presence of large human labour force.	<ol style="list-style-type: none"> 5. Employees to observe silence on site 	Record of noise complaints from neighbours & action taken	Project contractors, & COHSO Kilifi	From onset of construction work until completion	none
Actual construction work	<ol style="list-style-type: none"> 6. Construction work to be limited to day time, machine activity to be limited to construction site, noisy machines to be fitted with silencers 	Records of noise survey at construction site. Record of noise complaints from neighbours & action taken.	mngt, project contractors, & COHSO Kilifi	From onset of construction work until completion	100,000 for fitting of noise reduction devices.
Operation of emergency diesel generators leading to noise disturbance to guest & neighbours in operation phase	<ol style="list-style-type: none"> 7. -Procure generators that are optimised from noise reduction during operations. 8. -Install sound proof canopies on generator sets. 9. - Site the generator at locations least likely to be a nuisance to sensitive noise receptors (tenants & immediate neighbours). 	Presence of noise canopy	mngt.	Prior to purchase of diesel generators	Generator purchase cost.

9.7 Occupational Hazards Management Plan

9.7.1 Introduction

The objective of the Occupational Hazards Management Plan (OHMP) is to ensure that the construction and operations of the proposed apartment units' project do not result in occupational hazards to its employees. The OHMP covers possible occupational hazards such as falls, dust inhalation, high noise levels and collapse of structures under construction. The plan is to be achieved by continuous monitoring of work standards at site, implementation of recommendations and mitigation measures made in this report in respect to occupational hazards and ensuring the conditions subjected to EIA license approval with respect to occupational hazards are adhered to.

Employees working at construction sites are more often than not exposed to occupational hazards. These include but not limited to the following: -falls; inhalation of dust; high noise levels; and collapse of structures

- ✓ **Falls** –This exposes employee to possible hazards such as falling from height. Falls may result in bruises, injury or even in more serious cases, death. Falls resulting from working at height can also be hazardous to general public. This is so especially when materials and equipment being used may fall on passers-by thus injuring them. Occupational hazards resulting from working from height can be reduced by completely sealing off the construction site from access of general public use of appropriate protective gear like belts and elevators and training of workers on site on safety measures.
- ✓ **Dust Inhalation**-Inhalation of dust is a major occupational hazard at construction site. Mostly employees especially casuals are affected most. Adopting cleaner production technologies by preventing dust production can stop dust inhalation. This can be achieved by sprinkling water regularly when dry. Employees can be protected from inhaling dust by using appropriate dust masks.
- ✓ **High noise Levels**-Subjecting employees to high noise levels can result in an occupation hazards. High noise level can potentially affect normal functioning and hearing mechanism that may result in induced hearing loss. Noise sources at construction site include noise resulting from machine activity, noise resulting from loading and offloading of building materials, construction work and human activity. Employees can be protected from high noise levels by ensuring that machines likely to produce high noise are fitted with silencers and by providing employees with ear protectors.
- ✓ **Collapse of structures**- Sometimes building being constructed can be an occupational hazard to constructors and the general public. In the recent past, sections of building under construction have been reported caving in and collapsing killing employees on site and members of the general public. Collapse of building is associated with poor workmanship and not observing and maintaining required standards and specification. Such collapses can be avoided by ensuring that work standards are observed and that there is no compromise, site specifications are observed strictly, design specifications are observed and length of time for curing and other engineering requirements are observed

9.7.2 Enforcement

The OHMP guiding principle will be continuous and sustained improvement of site working conditions and activities, environmental performance, supported by regular feedback from employees, site engineers, neighbors and general public through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, The Occupational Health and Safety Officer, Kilifi and County Director of Environmental, Kilifi will be enjoined in actions taken. This will include giving them unlimited access to construction site to assess working conditions of employees, implementations of proposed mitigation measures and adherence to set standards and give government directives as provided for in the law.

Table 8 Occupational hazards management plan

Potential Environmental Impacts	Proposed mitigation measures	Surveillance	Actors	Timing	Estimated Cost (Ksh)
OCCUPATIONAL HAZARDS					
Falls -Injury to employees on site, to passers-by and general public -Damage to working tools & equipment -Damage to plants & animal life	1. -Fence off and seal site from public access a. Employees working at height to be provided with appropriate working gear 2. - Use appropriate elevators and other lifting machinery in conveying building material to high levels	Constant site inspections to ensure that required site working conditions are followed to the later.	Project proponent, Contractors, Site Engineer, Occupational Health and Safety Officer and County Director of Environmental	From onset of the project and then throughout the project life.	100,000 sealing off construction sites, purchase of appropriate equipment to enable employees work at height safely
Inhalation of dust Dust related ailment to employees, neighbours and the general public	3. Use effective dust screens to trap dust 4. - Provide employees with dust masks	Constant checks of effectiveness of dust screens, sampling and analysis of site particulate matter content	Project proponent, Contractors, Occupational Health and Safety Officer and County Director of Environmental	From onset of the project and then throughout the project life.	80, 000 for personal protective clothing
High noise levels Hearing effects to employees on site - Hearing impediments to neighbours & the general public -Noise induced hearing loss to workers & general public	5. -Carry out site noise survey 6. -Provide employees with ear protectors 7. -Fitting noise machines with noise reduction devices. 8. -Reduction of exposure duration.	-Reports of noise survey, feedback from employees, neighbours and general public -Carry out audiometric tests for exposed workers	Project proponent, Contractors, Occupational Health and Safety Officer and County Director of Environmental	From onset of the project and then throughout the project life	100,000 for noise survey, audiometric test and provision of PPE for workers
Collapse of structures Injury to employees - Death of employees Injury to visitors - Death of visitors to the site	9. -Building to be constructed strictly with specifications of structural Engineer's requirements 10. -Constant checking of adherence to required specification & verifications by Government Engineers 11. -Adherence to site specification 12. Adherence to time and material specifications ,	Constant inspection by site Engineers	Project Engineers, Project proponent, Contractors, Occupational Health and Safety Officer and County Director of Environmental	From onset of the project and then throughout the project life	100,000 soil engineering tests

9.8 Vegetation Management Plan

9.8.1 Introduction

The objective of the Vegetation Management Plan (VMP) is to ensure that building of the proposed apartment units does not result in significant loss and destruction of local vegetation. The VMP covers current vegetation on site and its importance and construction activities that may result to possible loss of vegetation. The plan is to be achieved by proper planning and mapping of all trees on site continuous monitoring of vegetation on site, implementation of recommendations and mitigation measures made in this report in respect vegetation management and ensuring the conditions subjected to license approval with respect to vegetation management are adhered to.

9.8.2 Enforcement

The VMP guiding principle will be continuous and sustained improvement on the number and species of trees and other plants on site, environmental performance, supported by regular feedback from Bestbase Investment Ltd, employees, site contractor, neighbours and general public through consultative meetings, management reviews and evaluations. To ensure adherence to the set conditions, The Kenya Forest Service Zonal Manager, County Director of Environment will be enjoined in actions taken. This will include giving them access to construction site to assess trees and other site vegetation condition implementations of proposed mitigation measures and adherence to set standards and give government directives as provided for in the law.

Table 9 Vegetation management plan action plan

Potential negative impacts	Proposed mitigation measures	Responsible actors	Monitoring	Timeframe	Cost estimates (KSH)
Clearance of vegetation ⇒ Soil erosion ⇒ Loss of top soil & organic matter ⇒ Reduction of space for sinking carbon in the atmosphere. ⇒ Reduction of the little available natural environments. ⇒ Loss of trees of medicinal value such ⇒ Exposing the ground to agents of erosion; ⇒ Loss of important patching and roosting ground for birds and other fauna; ⇒ Open ground will be exposed to direct sun hence potentially increase soil moisture loss.	<ol style="list-style-type: none"> 1. Along the periphery of the plots should not be cleared and the trees along the periphery to acts as wind breaks. 2. More trees should be planted along the periphery of the land 3. More trees should be planted along the periphery of the land and more sore on the lower end of the bordering the beach front. This will protect the beach from erosion. 	-Proponent, workers, -Environmental Officer Kilifi -Local community		Construction phase	100,000

10. ENVIRONMENTAL MONITORING

The proposed location of the proposed apartment units will require that regular monitoring of possible change in environmental parameters to be undertaken during the operational life of the housing units. The project proponent proposes to make use of waste water effluent treatment plant in managing and disposal of sewage. The possible impacts of this especially on ground water resource will require to be constantly monitored. With increased urban development come the challenges of waste handling and disposal. The monitoring programme to be developed must take into account possible impacts of waste disposal. All wastes emanating from the housing units and its disposal must be monitored to ensure no environmental degradation arises.

With these factors in mind, there will be a need to put in place elaborate and sound environmental management system and mechanisms of monitoring on a continuous basis the environmental performance of the housing units. Undertaking monitoring and auditing of key environmental parameters and putting in place of all approved recommendation of the environmental management plan and conditions of the licence will achieve this. Monitoring to be undertaken will be both active and reactive.

10.1 Active monitoring

Active monitoring will include:

- ✓ Monitoring of the achievements of specific plans of the EMP, performance criteria and fulfilment of objectives.
- ✓ Systematic inspection of work place.
- ✓ Surveillance and monitoring of the work environment, including the organization of work and activities involved;
- ✓ Monitoring of workers' health.
- ✓ Monitoring of compliance with laws, regulations and other requirements.

10.2 Reactive monitoring

This would include:

- ✓ Work related injuries, ill health (including record keeping and monitoring of sickness/absence), disease and accidents.
- ✓ Losses such as damage to property.
- ✓ Deficient safety and health performance.
- ✓ Workers rehabilitation and health restoration programmes.

10.3 Parameters

Monitoring will involve measuring, observing, recording and evaluation of physical, socio-economic and ecological variables within the project area and the neighbourhood. This may include the following: -

- ✓ Water quality monitoring for sources of domestic water.
- ✓ Solid waste disposal monitoring.
- ✓ Sewage disposal monitoring.

Water quality monitoring for sources of domestic water will involve monitoring in changes of the following variables:

Parameter	RESULTS	
	Observed value	Guide value (maximum allowable)
pH		6.5-8.5

Parameter	RESULTS	
	Observed value	Guide value (maximum allowable)
Nitrate NO ₃		30 mg/l
Ammonia-NH ₃		10 mg/l
Nitrite- NO ₂		3 mg/l
Total Dissolved Solids		1200 mg/l
E-coli		Nil/100mL
Fluoride		1.5 (mg/L)
Phenols		Nil (mg/L)
Arsenic		0.01 (mg/L)
Cadmium		0.01 (mg/L)
Lead		0.05 (mg/L)
Selenium		0.01 (mg/L)
Copper		0.05 (mg/L)
Zinc		1.5 (mg/L)
Alky benzyl sulphonates		0.5 (mg/L)
Permanganate value		1.0 (mg/L)

Source: Environmental Management and Coordination (Water Quality) Regulations; 2006.

10.4 Effluent monitoring for discharge into the environment

Effluent monitoring for discharge into the environment will be carried out as stipulated in the fourth schedule of the Environmental Management and Coordination (Water Quality) Regulations; 2006. The following parameters will be monitored for discharge into the environment; Biological Oxygen Demand (BOD), Total Dissolved Solids, pH, Faecal coliforms, oils and greases, temperature, colour, total phosphorus, Ammonia (as N), organic nitrogen (as N) and flow.

10.5 Monitoring schedule

Description of parameter	Monitoring schedule and duration
Ground water quality/sources of domestic water	Every three months
Solid waste	Daily throughout project life
Sewage disposal/effluent	Every three months

10.6 Environmental Auditing

Annual Environmental Audits should be carried out as provided for in the Environmental (Impact Assessment and Audit) Regulations of June 2003. The Audits will serve to confirm the efficacy and adequacy of the proposed Environmental Management Plan. The audits should include but not be limited to the following;

- ✓ Waste generation, management and disposal.
- ✓ Water analysis.
- ✓ Views and comments from neighbours.

Progress in implementation of Environmental Management Plan

11. Decommissioning Plan

11.1 Introduction

Decommissioning is the last phase of project life. It involves terminating project activities and operations and rehabilitating site to or close to its original state. In construction and building industry, decommissioning of a building which is still under construction can be necessitated if part of the building collapses or is declared unsafe due to various reasons including poor workmanship. On the other hand, if the buildings are already in use and are condemned and declared a safety hazard, then such buildings have to be demolished. Further, natural calamities such as earthquakes and tremors may destabilize a building necessitating its demolition

Decommissioning of the proposed project will address four main components namely:

- ✓ Efficient solid waste management.
 - ✓ Reduction of dust concentration.
 - ✓ Minimization of noise and vibration.
 - ✓ Restoration of the site to its original state.
- .
-

5.2 Conceptual Environmental Management Plan for the decommissioning phase of the Sandy Shores development

Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management			
1. All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Contractor, occupier	One-off	100,000
2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site			
3. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Contractor, occupier	One-off	
4. Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, occupier	One-off	
2. Rehabilitation of proposed project site			
1. Implement an appropriate revegetation programme to restore the site to its original status	Contractor, occupier	One-off	
2. Consider use of indigenous plant species adapted to coastal line geology and climate in revegetation	Contractor, occupier	One-off	
3. Trees should be planted at suitable locations so as not to interrupt slight lines (screen planting), between the vegetation growing at high water mark area and the development.	Contractor, occupier	Once-off	

12. Conclusion & Recommendation

12.1 Introduction

Best base Investment Limited proposes to establish a gate community housing project on plot MN/III/323, Msumarini beach, Kikambala, Kilifi County. The development will consist of 184 housing units on a 2.229-hectare beachfront property. At the time of commencement of the EIA study, some groundbreaking works had occurred prior to stoppage to pave way for the EIA process.

12.2 Conclusions

In summary, the following can be concluded:

1. The proposed project represents a significant investment in high quality housing development in the Msumarini and Kilifi county. Such an investment is likely to positive impact the local economy of the area during the entire project cycle as well as spur additional investment into the area.
2. The project site is on leasehold land tenure as are the other beach front properties. The neighbouring land on the second row is Kijipwa settlement scheme which is freehold. Sections of the Kijipwa settlement scheme have ongoing land disputes.
3. The proposed project site location on the Msumarini beach front presents both great opportunities as well as environmental constraints. A balance is necessary to ensure maximum utility of the beach front aesthetics as well as conservation and maintenance of existing ecological setup primarily related to coastline stabilisation and habitats protection.
4. Msumarini beach front has had reported turtle nesting sites. During the ESIA study no turtle nesting area where identified on the specific beachfront that the proponent intend to develop owing to the disturbed nature of the site.
5. There are two formal beach access routes along the Msumarini beach front. The nearest to the project site is about 300 meters and another one bordering the defunct Paradise beach hotel.
6. The Msumarini community is upbeat about the employment opportunities that will be generated in the locality. Additionally, there anticipated benefits of improved road infrastructure and social amenities in the local public schools.

12.3 Recommendations

The ESIA study team recommends the housing venture project for licencing subject to the following proposals to inject environment sustainability:

1. Project to priorities employment of local labour and content in the project implementation & operational cycle;
2. Implementation of the project be sensitive to the set riparian zone and preserve all emergent riparian vegetation. No development should be encouraged in the 60-meter riparian;
3. . There is need for continuous proactive monitoring to identify marine organisms nesting areas and conserve them *in-situ*.

4. An adequately sized bio digester system be incorporated into the project design to handle effluent from the housing development;
5. Additional renewable energy incorporation into the housing project will decrease its carbon foot print & overall running costs;
6. All solid waste to be collected, handled and disposed off in accordance to EMC (Waste Management) Regulations ,2006;
7. Storm water drains be designed to harvest rain water for none consumptive use and the excess percolate water into the ground;
8. All effluent waste to be collected and disposed in accordance with to the EMC (Water quality Regulations), 2006;
9. Any firm contracted to handle waste must be duly licensed by NEMA; and
10. Occupational Health and Safety regulations to be adhered to in accordance to the Occupational Health and safety regulations 2007.

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ANNEXES

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Annex 3	Copy of certificate of incorporation of Bestbase Investment & PIN certificate
Annex 4	Copy of development application approval PPA2
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