

**REPUBLIC OF KENYA**



**MINISTRY OF WATER & SANITATION**

**COAST WATER SERVICES BOARD (CWSB)**



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**ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR  
DRILLING AND EQUIPPING OF THREE (3) REPLACEMENT  
BOREHOLES AT BARICHO WELLFIELD**

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**MARCH 2019**

**COAST WATER SERVICES BOARD**

## **1. EXECUTIVE SUMMARY**

Following the collapse of three boreholes at the Baricho Wellfield, CWSB as part of its mandate intends to drill three replacement boreholes in the same wellfield in Malindi Sub-county of Kilifi County.

The following report presents an Environmental and Social Management Plan (ESMP). The purpose of the ESMP is to define mitigation/enhancement, monitoring, measures to be undertaken during project implementation and operation phases.

This ESMP report shows that the project poses issues of concern related to social, economic development as well as environmental conservation. It is for this reason an Environmental and Social Monitoring Plan was prepared as a necessity for the project implementation.

The plan provides the key Environmental and Social concerns, appropriate mitigation measures, responsibilities and Institutional arrangements during project implementation, targets to be achieved, and where possible estimates of the respective costs. Some of the Environmental and Social Impacts identified for mitigation and management include:

- Loss of flora and fauna
- Air pollution
- Noise and Dust
- Generation of solid and liquid waste
- Pollution of water resources
- Health and safety risks

Mitigation measures for each of the negative impacts include:

- Preparation of construction site environmental and social management plans, by the contractor, will be required for all works. This plan will include a waste management plan for all activities during the borehole drilling period.
- Protection of surface water and plans for restoration measures after construction.
- Scheduling construction activities appropriately to reduce high noise levels particularly at night from noisy activities.
- Avoidance of areas sensitive to erosion.
- At the end of construction works, leveling off the soils and facilitation for vegetation regeneration.
- Prevention of work place injuries during construction e.g. by means of signs, signals, barricading, etc.
- Employment of occupational Safety and Health measures as required by law.

The ESMP highlights the impacts and the mitigation measures are highlighted as part of the ESMP in addition, the responsible parties for carrying out the mitigation measures.

The Cost of implementing the ESMP is estimated at K.Shs. **4,700,000.00** Which is inclusive of site visits by an environmental auditor to ensure the mitigation measures for the negative impacts are being adhered to.

The measures proposed are to promote environmental and social sustainability and provide basic guidelines for the Contractor(s) and the Supervision on the implementation of the mitigation measures through the project construction and the borehole use thereafter.

These boreholes will be constructed in the existing well field that was acquired, delineated and fenced off hence there will be no people affected by the project(PAPs) and hence there will be no Resettlement Action Plan (RAP) needed.

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## **2. INTRODUCTION**

The Coast Water Services Board (CWSB) is a Parastatal (Government Owned and Autonomous) created under Water Act, 2002 and established through a Gazette Notice No. 1328 of 27 February 2004.

CWSB (or the Board) is the agency charged with the responsibility for the effective and efficient provision of water and sanitation services within the Coast Region. The Board undertakes this by contracting Water Service Providers.

Seven Water Services Providers (WSPs) whose areas of jurisdiction correspond with the seven initial districts of Coast Province, namely, Mombasa, Malindi, Kilifi, Kwale, Taita and Taveta, Lamu and Tana River have been appointed by the Board to provide water and sanitation services in their respective jurisdictions. The WSPs are Mombasa Water and Sanitation Company (MOWASCO), Malindi Water and Sanitation Company (MAWASCO), Kilifi Water and Sanitation Company (KIMAWASCO), Kwale Water and Sanitation Company (KAWASCO), Taita and Taveta Water and Sanitation Company (TAVEVO), Lamu Water and Sanitation Company (LAWASCO) and Tana River respectively.

Unlike in other parts of the country, CWSB is also the water undertaker for the Coastal Bulk Water Supply System. Additionally, the Board is the asset holder of all public water and sanitation facilities within its area of jurisdiction.

Following the collapse of existing borehole nos.1 and misalignments of boreholes 3 and 4 at the Baricho wellfield CWSB has undertaken to drill and equip three (3) replacement boreholes to ensure that the design capacity of the plant is fully met.

The works include:

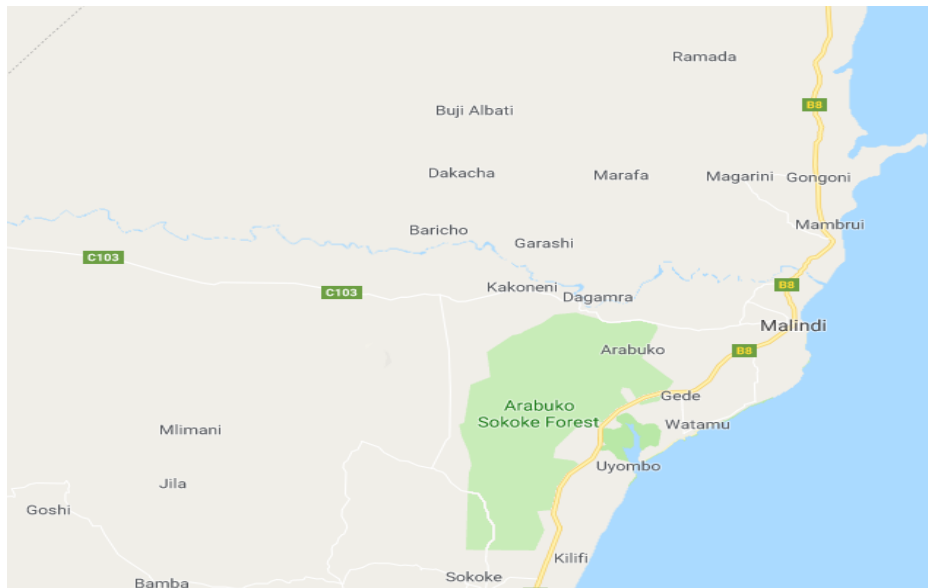
- I. Drilling, development and equipping of three (3) new replacement boreholes in the existing Baricho Well fields for Boreholes 1,3 and 4 at Baricho wellfield,
- II. Connecting the replacement boreholes to the collector pipelines
- III. Upgrading and connecting electric power to the three (3) replacement boreholes.
- IV. Construction of Motor Control Centers (MCC) for the new replacement boreholes.

The above activities include:

- I. Hydrogeological survey
- II. Actual drilling of the borehole
- III. Casing of the borehole with both plain and screened casings
- IV. Gravel pack installation
- V. Development of the borehole
- VI. Test pumping of the borehole vii. Equipping of the borehole

This report presents the Environmental and Social Management Plan for the proposed works. for the 3(three) replacement boreholes.

### 3. PROJECT LOCATION



**Map1:** The Baricho wellfield s located at Lango Bay in the banks of River Sabaki

### 4. EXPECTED IMPACTS

The project is expected to restore the volumes of water that were being delivered by the collapsed boreholes. Thus successful implementation of the project will have high socioeconomic benefits to the people within the WSPs' (MAWASCO, KIMAWASCO and MOWASSCO) area that depended on this system and will contribute to their positive health and well-being. The negative impacts which are localized within the borehole drilling area are considered not significant and not long term can be mitigated with appropriate mitigation measures.

**a) Planning Phase:** This could be the acquisition of land for the boreholes, however the land has already been acquired (existing wellfield) for the project. As such no impacts are foreseen at this phase of the project

**b) Construction Phase:** The potential environmental and social impacts associated with the construction phase will be largely negative and temporary, and can be mitigated with the use of standard environmental management procedures. The potential negative social impacts or nuisance will be those typically associated with construction activities involving vehicles, equipment, and workers. However, there will also be positive impacts which include economic boost from injected construction money which is spent in the local environment for purchasing food and other supplies, rental accommodation and local travel. Also, there will be opportunity for skills development through skills transfer and skills acquisition. With increased construction money/ economy and people interaction may lead to increased cases of HIV and AIDS

**c) Operation Phase:** Improved quality of life due to multiplier effects of improved service delivery i.e improved access to good quality water, less water-borne diseases, improved comfort and regional prosperity. Negative impacts associated with operations include solid waste disposal from the facilities, bursts and leaks from poor maintenance.

### 3.1 EXPECTED NEGATIVE IMPACTS AND PROPOSED MITIGATIONS

Table1

Potential Impacts	Mitigation Measures	Responsibility
<p><b>Loss of Vegetation</b> During construction, vegetation will be cleared to give way to drilling activities and connecting pipelines to the collector line.</p>	<p>The <b>contractor</b> shall ensure that the clearance of the site for construction is kept to minimum. Retention of vegetation where possible. Care will be taken to minimize damage of vegetation cover within the borehole location and well field at large. The <b>Resident Engineer</b> shall ensure that removal of vegetation is avoided until such a time as clearance is required and exposed surfaces are re-vegetated or stabilized as practically possible.</p>	<p>Contractor Supervising consultant</p>
<p><b>Soil erosion</b> Excavation/drilling and heavy machinery movement will expose top soil to possible soil erosion</p>	<p>Loose soils to be used to fill back excavated/disturbed areas. Loose soils to be compacted with a mechanical roller so as to avoid erosion by wind or surface runoff.</p>	<p>Contractor</p>
<p><b>Noise and Air quality concerns</b> Expected sources of noise pollution include vehicles and machinery. Air pollution is anticipated to arise from excavation and movement of earth material, exposure of bare soil to wind, exhaust from engines and burning of solid waste on site</p>	<p>Selection of appropriate machinery and regular servicing of machinery and vehicles Restrictions to standard hours of site works. Water spraying on dusty sites during strong wind. Covering materials and wastes, during transportation. Provision by <b>contractor</b> and Use of ear plugs by construction workers</p>	<p>Contractor</p>
<p><b>Increased generation of waste</b> Solid waste is anticipated to be produced through electromechanical and civil works</p>	<p>The <b>contractor</b> shall provide litter collecting facilities. Dispose waste at sites approved by <b>Resident Engineer</b>. Adhere to waste management regulations of 2006. Adoption of waste segregation and minimization approach as part of the construction works. Monitoring the fate of disposed wastes to ensure they are being legally land filled at a recognized controlled site.</p>	<p>Contractor Supervising consultant</p>
<p><b>Visual impact (Aesthetic Quality)</b></p>	<p>Minimize destruction of vegetation. Replanting of vegetation after completion of works Avoid having open trenches in an area for a long period of time. Improve impeded drainage through landscaping and filling in the created depressions and trenches.</p>	<p>Contractor</p>

<p><b>Health and Safety risks</b>  Risk of accidents and incidents will be heightened with the construction activities. Construction workers will be in direct contact with heavy machinery and equipment. Health, safety and security are important aspects throughout the project implementation.</p>	<p>Design and implementation of safety measures and emergency plans to contain accidents risks. Regular training on health and safety to workers shall be conducted. Provide workers with protective clothing (nose and mouth masks, ear muffs, overalls, industrial/safety boots and gloves) and helmets. Avail first aid kits on site</p>	<p>Contractor</p>
<p><b>HIV/AIDS and increased disease risks</b>  Increased disease risk can occur due to population and social interactions between immigrant workers and local population such as is the case of HIV/AIDS and other STDs</p>	<p>HIV/AIDS awareness campaigns to be conducted throughout the entire project construction period.</p>	<p>Contractor</p>
<p><b>Gender Concerns – Recruitment, GBV, SH, SEA</b>  Construction workers are predominantly young active males who will be economically empowered by the project. Those away from their matrimonial home are separated from their family and act outside their normal social control. This can lead to inappropriate and indecent behaviour such as sexual harassment of women and girls, sexual exploitation and illicit sexual relations with minors from the local community</p>	<p>Contractor to develop Code of Conduct for the workers  Sensitize employees and community on gender concerns  Recruitment of both skilled and non-skilled labourers to give equal opportunities to both gender  Provision of sanitation facilities to be gender sensitive  Carry out a GBV risk assessment  Identify the existing GBV service providers</p>	<p>Contractor  Supervising Consultant (Resident Engineer)  CWSB</p>



## 5. ENVIRONMENTAL MANAGEMENT AND MONITORING

Impact	Proposed Mitigation and Monitoring	Responsibility	Impact Rating	Monitoring Indicators	Frequency of monitoring
Impacts on Land and Soil- <i>Mainly Oil and grease spills, and soil excavations</i>	<ul style="list-style-type: none"> <li>- Ensure management of excavation and drilling activities.</li> <li>- Proper refilling of the excavated cuttings pit and power cables.</li> <li>- Proper storage, handling and disposal of oil and oil wastes during construction</li> <li>- Any maintenance of construction vehicles should be carried out in the contractor's yard or at a petrol station.</li> </ul>	Contractor Supervising Consultant	Low	<ul style="list-style-type: none"> <li>-Oil and grease spills on the ground</li> <li>-Excavated channel</li> </ul>	Throughout drilling operation
Impact on Air Quality - <i>Mainly dust and fumes from machinery</i>	<ul style="list-style-type: none"> <li>- Ensure proper working conditions of exhaust systems of the borehole drilling and construction machines.</li> <li>- Water earth stockpiles.</li> <li>- Provide drill crew with dust masks.</li> </ul>	Contractor Supervising Consultant	Low	<ul style="list-style-type: none"> <li>Level of dust in the vicinity of project site.</li> <li>Level of fumes in the vicinity of the project site.</li> </ul>	Throughout drilling operation
Impacts on Water Resources- <i>Quality and Quantity</i>	<ul style="list-style-type: none"> <li>- Prevent construction materials and other debris (mud from the drill, grout, etc.) from entering waterways.</li> <li>- Ensure protection of the riverine ecosystem by proper handling of cement during grout filling</li> </ul>	Contractor Supervising Consultant	Low	<ul style="list-style-type: none"> <li>-Water quality analysis</li> <li>-Water level fluctuation in the borehole.</li> </ul>	Periodically

	-Put proper measures for collection and disposal of spilled oils and lubricants.			-	
Impacts on Public health and occupational safety	<ul style="list-style-type: none"> <li>- Establish a Health and Safety Plan (HASP)</li> <li>- Provide proper protective gears to all workers</li> <li>- Ensure that there are no spills of petroleum, no smoking, no source of ignition</li> <li>- Appropriate use of warning signs in explosive environment.</li> <li>- Provide insurance cover to all project participants</li> <li>- Readily available vehicle in case of any medical emergency</li> <li>- Provide fully equipped first aid kit at site.</li> <li>- Emergency plans should be communicated and well understood.</li> <li>- Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, awareness campaigns</li> <li>- Provide appropriate human and solid waste disposal facilities</li> </ul>	Contractor Supervising Consultant	Low, but potentially high	<ul style="list-style-type: none"> <li>-Number of accidents/injuries recorded</li> <li>-Response time in case of emergencies</li> <li>-Frequency of water related illnesses among the community</li> </ul>	Daily  - throughout drilling operation

Impacts on Biodiversity	- Avoid cutting and destruction of trees and shrubs during the drill process and allow vegetation generation	Contractor	Low	- Number of trees/vegetation cover in the project site	Throughout the construction period and After construction
Visual Impact	- Clearance of site after works completion	Contractor	Low	-	-

## 6. ENVIRONMENTAL MITIGATION COST ESTIMATES

Table below shows cost estimates for environmental mitigation. The brief description of the items is for identification purposes and does not supersede or modify the detailed descriptions of works in other sections of the report and in the main engineering Bills of Quantities.

**Table 3:** Cost Estimates for Environmental Mitigation

S/No.	Item description	Unit	Quantity	Unit Price (K.Shs.)	Item Cost (K.Shs.)
1	Emergency measures in case of accidental oil spill	LS	1	200,000.00	200,000.00
2	Formulate a Healthy and Safety Management Plan, train workers on health and safety procedures and emergency response in case of a fire outbreak, and other risks	LS	1	300,000.00	300,000.00
3	On completion of construction works, reinstatement of ground for vegetation regeneration	Ha	1.5	100,000.00	150,000.00
4	Provide waste collection bins at strategic points and ensure that all solid wastes are transported to a place of safe disposal (approved).	No.	20	2000	40,000.00
5	Provide Personal Protective Equipment (PPE) to the construction crew – helmets, overalls, gum boots, earplugs and dust masks, hand gloves	set	500	3000	1,500,000.00
6	Provide First Aid Kits	No.	10	5000	50,000.00
7	Sensitize workers and the surrounding community on Gender based violence, awareness, prevention and management of HIV/AIDS and other STDs through staff training, awareness campaign, media, and sign boards in local languages, workshops and during public Barazas.	Session	3	100,000.00	300,000.00

S/No.	Item description	Unit	Quantity	Unit Price (K.Shs.)	Item Cost (K.Shs.)
8	Bi-weekly morning talks to workers on Environment, Health and Safety	No.	10	1000.00	10,000.00
9	Provide condom dispensers at appropriate locations	No.	5	LS	100,000.00
10	Spraying Mosquito breeding sites	LS	1	LS	100,000.00
11	Provide signage at construction site	LS	1	LS	50,000.00
12	Environmental supervision, monitoring, and evaluation over a period of 8 calendar months	Months	8	200,000.00	1,600,000.00
13	Provisional sum to be spent as directed by the Engineer on miscellaneous environmental issues like sampling and testing	LS	1	300,000.00	300,000.00
	<b>TOTAL</b>				<b>4,700,000.00</b>

## **7. CONCLUSION AND RECOMMENDATION**

The project, overall, will have substantial significant positive social, economic and environmental benefits. It will enhance accessibility to sufficient potable water within the respective Water Service Providers (WSPs) areas of jurisdiction in the region.

Monitoring has been identified as an important process in the protection of environment of the project area and addressing social concerns since it will reveal changes and trends brought about mainly by the construction and operational activities.

The project activities are likely to cause albeit on a small scale disturbance of vegetation, risk of accidents, health, and emission of dust, risk of gender-based violence (GBV) and/or sexual exploitation and abuse and increase in noise

The adverse impacts on the physical and natural environment will be not significant, and can be well managed through the recommended mitigation measures.

**Appendix: Photos**



**One of the damaged boreholes (Borehole no. 3) and the then protection surrounded by the flooding water**



**One of the recently constructed borehole (no.11) which was still under construction during the flooding**



**The new transformer house after flooding**



**Damaged borehole electrical fittings**



**The River Sabaki that ate into the wellfield.**



**The damaged wellfield**