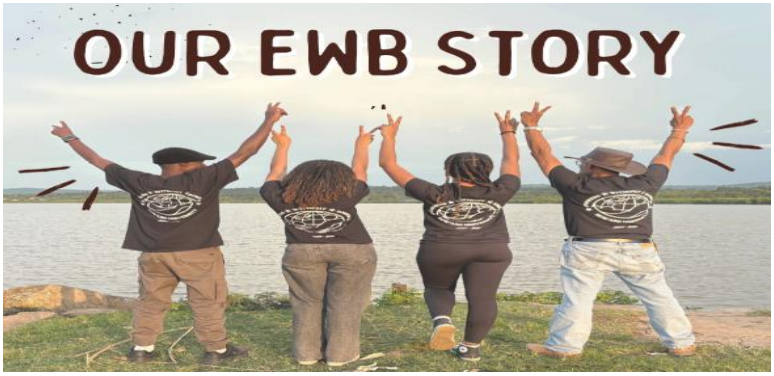
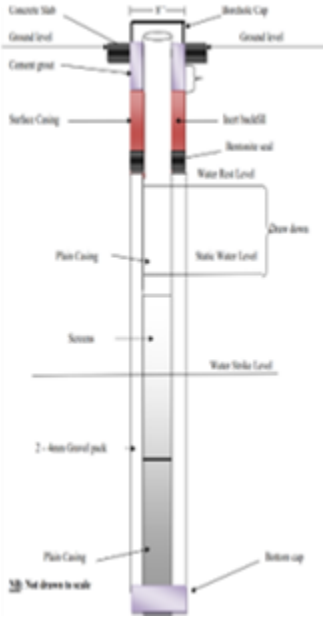
Project Overview and Background



A student-led Engineers Without Borders (EWB) team from Howard University is working to improve access to safe and reliable drinking water for the Kogwari community in Homa Bay County, Kenya. The Kogwari people, consisting of approximately 180 families, live in a semi-arid region where water access is limited and unreliable. The community currently depends on seasonal water pans and distant boreholes in neighboring communities, both of which are unsafe or inconsistent sources of water.



Schematic design for borehole completion

This partnership began in Fall 2024 when the Howard University chapter formally adopted the project. In May 2025, a student and faculty team conducted an assessment trip to Kogwari to evaluate community needs, build relationships, and determine project feasibility. During this visit, the team completed household surveys, met with community elders, and worked with hired contractors to perform a hydrogeological survey and an environmental and social impact assessment. These studies confirmed that soil erosion had reduced the capacity of water pans and that there is no separation between livestock and human water sources, contributing to frequent cases of typhoid, cholera, and other waterborne diseases. Women and children are primarily responsible for collecting, often walking long distances and missing school or work.

The team identified a central borehole location near Alara Seventh Day Adventist Church on land donated by Joshua Olang'o, with official approval granted by the Homa Bay Municipality. Following review of all technical data and confirmation of community support through a signed agreement, the project moved into the implementation phase.

Drilling took place in December 2025 completed by a local contractor. The Howard University implementation team will then travel from May 12th to May 23rd,2026 to support system installation, construction oversight, and community training.

The completed system will include a solar-powered pump, elevated storage tanks, a water sanitization system, and a piped distribution network designed to provide approximately 30,000 liters of clean water per day. This infrastructure will establish a sustainable, community-managed water supply that improves public health and strengthens resilience to drought.

Successful Collaboration of Faculty, Students, and Licensed Professional Engineers

This project is implemented through collaboration between students, faculty, licensed engineers, and in country technical experts in partnership with Engineers Without Borders USA. Technical oversight is provided by Philip Wolstenholme, Responsible Engineer in Charge, a retired environmental engineer with more than forty years of experience in water and wastewater systems and extensive work in East Africa. Faculty guidance is led by Dr. John Tharakan, Professor of Chemical Engineering at Howard University, who has directed international water access projects since 2008. In Kenya, civil and structural engineer Moses Sikuku serves as on site mentor, advising on procurement, pipeline installation, elevated storage tanks, and regional construction practices.

Student leadership directs day to day coordination and technical development. Lydia Wosen, Project Lead and Mechanical Engineering major, oversees design progress, stakeholder communication, and compliance with EWB review standards. Monica Maya, Chapter President and Health and Safety Officer, and Gabrielle Belcon, Logistics Coordinator, manage travel approval, safety planning, documentation, and on site

coordination for implementation. Together they ensure that engineering design, safety compliance, and trip logistics remain aligned with university and organizational requirements.

Financial management, communications, and sustainability planning are led by a multidisciplinary team. Emilomo Unuigbe, Financial Coordinator, develops and tracks the project budget, oversees purchasing logistics, and monitors fundraising progress. Evelyn Vaughn, Communications Lead, manages sponsor outreach, stakeholder updates, and institutional engagement within the College of Engineering and Architecture. Yenovel Yilma, PMEL and Education Lead with a background in civil engineering and sustainable construction, directs monitoring and evaluation strategy while supporting community education to ensure long term system ownership and operational sustainability.

Protection of the Health, Safety, and Welfare of the Public

Protecting public health is the central purpose of this project. Kogwari residents currently depend on untreated surface water sources that are shared with livestock and are vulnerable to runoff contamination during rainy seasons. This exposes families to waterborne diseases such as diarrhea, cholera, typhoid, and parasitic infections, which disproportionately affect children and older adults. Frequent illness contributes to missed school days, reduced productivity, and increased Drilling a protected groundwater borehole will access a deeper aquifer that is less susceptible to biological contamination. The addition of a structured treatment and distribution system will create a controlled water supply chain from extraction to point of use, significantly reducing exposure to harmful pathogens and improving overall community health outcomes.

Property Tested	Lake Bottle	Lake Bottle	Otaro Bottle	Otaro Bottle	B1 Bottle	B1 Bottle	B2	B3	WHO
pH	6	6	8	8	8	8	8	8	5
Caco3 (mg/L)			425	425	425	425	100	425	60
Fe (mg/L)									0.3
Cu (mg/L)			0.2	0.2					0.1
Pb (mg/L)			5	5	5	5	5		0.05
Mn (mg/L)									0.1
Cl (mg/L)									250
Hg (mg/L)									0.001
No3 (mg/L)									10
No2- (mg/L)									0
So4 (mg/L)									400
Zn (mg/L)					5	5	5		5
F (mg/L)									0
NaCl (mg/L)									0
TA (mg/L)	120	120	180	180	180	180	180	180	0

Results from water testing compared to W.H.O

Water safety is incorporated into the engineering design at multiple stages. Borehole water will be tested for microbial contamination, turbidity, pH, iron content, and other relevant parameters to determine the appropriate treatment method. Based on these results, the system will include desalination method to eliminate bacteria and viruses

and filtration to remove suspended solids and improve clarity and taste. Elevated storage tanks will be sealed and constructed from durable, food grade materials to prevent external contamination. The elevation of the tanks will provide consistent gravity driven pressure, reducing stagnation and supporting reliable flow throughout the network. A closed pipe distribution system will transport treated water directly to tap stands, eliminating the need for residents to collect water from open ponds or streams. By reducing household storage time and minimizing exposure to open containers, the design directly addresses the risk of recontamination after treatment.

Public safety is strengthened through improved access and reduced physical strain. Currently, many residents walk long distances over uneven terrain while carrying containers that can weigh more than forty pounds when full. This daily burden increases the risk of musculoskeletal injuries and fatigue, particularly for women and children who are primarily responsible for water collection. Strategically located tap stands within the community will reduce travel distance and time, lowering physical stress and improving daily safety. Closer access to water also improves sanitation practices, as households are more likely to use sufficient water for handwashing, cooking, and cleaning when it is readily available.

Long term system safety and reliability depend on strong community capacity. During the May 2026 implementation trip, the Howard University team will conduct structured training sessions focused on borehole operation, solar powered pump maintenance, routine inspection procedures, leak detection, valve control, and basic troubleshooting. Community members will also be trained in water quality monitoring practices and record keeping to track system performance over time. A local water committee will receive guidance on financial management, including fee collection and budgeting for future repairs or part replacement. Establishing technical knowledge and administrative oversight within the community ensures the infrastructure remains functional, properly maintained, and fully managed by Kogwari residents beyond the duration of the project.

Multidiscipline and Allied Profession Participation

This project integrates multiple engineering disciplines and allied fields. Civil and environmental engineering principles guide borehole siting, pipeline routing, and structural tank design. Mechanical and electrical engineering concepts inform pump

sizing and solar power integration. Chemical and environmental engineering knowledge supports water quality testing and treatment selection.

Students also develop skills beyond technical engineering. Project management, fundraising, and budgeting are coordinated by chapter leadership, Monica Maya. Travel logistics for the 12-person Howard team and in-country coordination are managed by Gabrielle Belcon. Health and safety planning by Rachel Maxwell ensures risk mitigation during international travel and construction activities. Educational outreach and monitoring led by Yenovel Yilma incorporate public health and sustainability perspectives.

Partnership with local professionals, government officials, and community leaders ensures the project is culturally appropriate, logistically feasible, and technically sound.

Knowledge and Skills Gained

Students involved in the Kogwari project gain hands-on experience applying classroom knowledge to a real-world humanitarian engineering challenge. They develop technical skills in water system design, pump and storage sizing, and water quality evaluation, while working under the supervision of licensed engineers like Philip Wolstenholme and Moses Sikuku.

They also build professional skills in leadership, communication, budgeting, and cross-cultural collaboration. Planning an international implementation tr[ip from May 12–23, 2026, coordinating flights, lodging, transportation, and daily field activities provides practical project management experience rarely available in traditional coursework.

Ethical responsibility is a core lesson. Guided by Dr. John Tharakan and the REIC, students learn to prioritize public health, safety, sustainability, and community

ownership. They see firsthand how engineering decisions affect daily life, reinforcing the importance of thoughtful, people-centered design.

Overall, the Kogwari water project equips students with the technical competence, ethical foundation, leadership experience, and global perspective needed to become responsible and impactful engineers.