**Assessment – Pre-Trip Plan**

|  |  |
| --- | --- |
| **Executive Summary** | |
| **Community:** | Obrachere |
| **Country:** | Ghana |
| **Chapter:** | EWB-UMD |
| **Submittal Date:** | 6/18/2019 |
| **Authors:** | Team Members |
| **REIC and other mentors:** | Dr. Jungho Kim ( Faculty Advisor, Mechanical Engineering), Lee Bristol (REIC, Renewable Energy and Environmental Resources), Peter Chang (Faculty Advisor, Civil Engineer) |
| **Scope of Work for the project (50 words) 1** | The objective of this project is to design and implement improvements to the Obrachere Secondary Technical School, focusing especially on water and energy projects. |
| **Scope of Work for the trip (100 words) 2** | The purpose of this trip is to identify the most crucial needs of the school and the community that the chapter can address. The travel team will collect verbal information, observations, and quantitative data to determine the feasibility and the importance of different possible projects. Also, the team will collect technical data to aid in the design process in the future. |
| **Proposed Next Step**  **(100 words) 3** | After this assessment trip, the travel team will put all of the observations and technical data into the post-assessment report. EWB UMD will then use this information to decide on the most feasible initial project and work through an alternatives analysis. Depending on community needs, this project could involve water distribution and treatment, solar implementation, or other sanitation and infrastructure projects. After the alternatives analysis, the chapter will begin the design process on the chosen project. |
| **Describe Recent Contact with Community, NGO, and in country partners.**  **(100 words) 4** | Primary contact is with the NGO, Changing Lives Together. Specifically, contact is mainly with Lawrence Kumi, the in-country partner from the NGO. EWB UMD has had recent video calls with him in order to talk details about the project and travel. This is the most recent contact with anyone from in country. The chapter is also in contact with the technical school through the headmistress, Gifty Andoh Obrachire. |
| **Describe the Chapters current fundraising goals and milestones.**  **(100 words) 5** | Due to grants that have been received from various sources, the chapter is on track with fundraising for assessment and implementation. We are continuing to apply for grants and carry out ongoing fundraising. |
| ☒ **6** | **IS THE PROGRAM STILL ON TRACK TO MEET THE EWB PROJECT EXPECTATIONS?** |

**Privacy:** EWB-USA may release this report in its entirety to other EWB-USA chapters or interested parties. Once the report is approved any member in Volunteer Village will be able to find and view the plan. Please do not include personal or sensitive information.

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| --- | --- | --- | --- |
| **Project Timeline 1** | | | |
| **Major Milestone** | **Previous Date 3** | **Current Date 3** | **Description** |
| **Program Adoption Date** | 05/01/2019 | 06/05/2019 | Program approved as an EWB-UMD project by EWB-USA |
| **Project Approval Date** | 05/01/2019 | 06/05/2019 | Project approved by EWB-USA |
| **Planned Assessment Trip** | 08/01/2019 | 08/10/2019 | Trip to sign partnership agreement and complete data collection |
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# Project Description

This project will benefit the Obrachere Secondary Technical School located in Obrachere, Ghana. Established in 1991, the school has a total of 1347 students that attend, with 611 students that live on campus and 736 students that commute each day. Students attend three years of schooling and have an option to pursue a technical track. Our chapter came into partnership with the school through the non-profit Changing Lives Together, which we previously worked with on past projects. The school has approximately twenty buildings on campus, including classrooms, computer labs, and kitchens. The leaders of the school have identified water and energy issues on campus.

Obrachere Secondary Technical school has unreliable electrical and water systems. They are connected to a grid, but there is spotty connection with frequent brownouts and blackouts. The electricity is used to power lights in the buildings, fans in the classrooms, computers in the labs, and blowers for stoves in the kitchens. These are all affected by the unreliability of the grid. For water, they have water from a borehole stored in a tank, water from the local utility Water Works (from a local reservoir), and access to a nearby stream. However, there isn’t water treatment and water distribution throughout the school buildings. During the dry season, water is only available from Water Works during certain hours and there is not enough borehole water to fill tanks. To reach the stream, students have to walk over twenty minutes round trip, two to three times a day, in order to fetch water. Our project will address one of these problems that the school is facing. The assessment trip will be vital to gather data and observations in order to determine the project that is the most feasible to implement and most helpful to the community.

## Project Background and History

This trip would mark the beginning of the partnership of EWB-UMD with Obrachere Secondary Technical School in Obrachere, Ghana. Our chapter has had a partnership with a boarding school in Suma Ahenkro, Ghana for the past five years. We made connections with this community through the non-profit organization Changing Lives Together. Through this organization, we were introduced to the community and school in Obrachere.

On our last implementation trip to Suma Ahenkro, our chapter briefly visited the technical school in Obrachere to take some photographs and gather some initial data. From this trip, our chapter gained general knowledge and met with leaders of the school. We were able to begin the partnership process, form a relationship with community members, and identify some possible projects they might want to implement. This assessment trip will be the first official visit to the community involving data collection and gathering of specific information.

## Project Context

EWB-UMD is planning on conducting an assessment trip to a community located in the town of Obrachere, Ghana in order to identify a potential implementation project for the future. The Obrachere Secondary Technical School school is funded by the government and has over 1300 students. The school is about an hour away from both the capital city of Accra and the closest hospital shock trauma center, while only 30 minutes away from the hospital. Most residents in this community make a living from the cash crop industry. Recently the government funded the construction of a rainwater collection system for the school and the school just replaced their well pump.

The primary water source is from the nearest water stream as well as a borehole well. These sources are known to run dry during the dry season. Water Works provides water to the community during certain hours of the day during the week. This is also an unreliable source of water as the water is not consistent. The school has a small rainwater collection system that is not adequate to supply water throughout the dry season. The school experiences no water shortages except during the dry seasonwhich runs from approximately December to April. Furthermore, the community does not have a means to treat their water, therefore the water quality is not always safe to drink.

The community has an electrical grid for their power needs, but it is not reliable as outages are common from around 10 am - 5 pm about two to three times a week. Although the school has a generator for when the power goes out, it is inefficient and requires expensive fuel to operate. The school has a solar powered computer lab classroom. The school currently needs a better power source for computers in other classrooms, kitchens, lights, and fans.

The Obrachere community currently has ventilated pit latrines for their sanitation needs, but there are no sewage systems or treatment plants in place.

## Project Goals and Objective

The objective of this assessment trip is to collect necessary and pertinent information that will be beneficial to future implementation projects. The data that we collect will help in improving the quality of our future projects, which could include a water distribution, storage, and treatment project, or a project where we address the community’s electrical needs. We will determine whether future projects have the potential to last long-term, while also assessing the social, environmental, and technical merits of potential projects. From this information, we will make an informed “go/no go” decision on whether to continue with the design of implementation projects.

The main objectives of our partnership is to provide a reliable source for electricity and water to the town of Obrachere, Ghana. EWB-UMD hopes to find a solution to the inconsistent electrical grid present to resolve issues regarding lack of electricity and other energy sources. In addition, EWB-UMD aims to identify alternative sources for water that are accessible and within proximity to the town. The assessment trip to Obrachere will be done to explore potential solutions for the objectives, as well as to survey the town to see what resources Obrachere has to offer.

## Scope of Work

The scope of work for this project will vary depending on the current situation in the community in Obrachere and includes anything from milestones, reports, and deliverables. In terms of reports and documentation, we have started an “information needed” report, so as to be prepared to investigate what needs to be taken care of, and the potential solutions that would be utilized to solve these problems. This can include things such as a detailed load analysis, structural analysis, an available resources list, etc. The Scope of Work should also include any end products for this project. Lastly, a timeline should be kept in order to keep track of the various reports, and keep everything organized.

## Potential Solutions Considered

The first option being considered is addressing the new community’s power needs. This would involve figuring out how much power the community uses versus how much they need and filling the gap that their current power supply does not. The solution to this potential problem is to implement a photovoltaic system. The next option being considered is improving water resources. This would involve testing the water for any diseases or toxins, determining how accessible their water resources are, and figuring out what infrastructure the community needs. Another option includes things that the community may not know they need to improve such as structural failures and electrical malfunctions. Also noted in section 3.4, various other tests are going to be conducted. Some of the important ones include a structural stability analysis, determining what type of solar panel orientation would be the most effective, and a full load analysis. If problems arise in any of the scenarios given, then there are steps to address these issues. For structural stability, we can assess if various zero-force members are necessary, and reinforce load-bearing members. For the solar panel orientation, we will take note of which areas around the school receive the most sunlight, and adjust our plans accordingly (whether it’s better to place the panels on the roofs of the buildings or on ground mounts). A load analysis will be performed to determine the size of PV systems.

## Project Team

The REIC for this project will be Lee Bristol, who is the Executive Director of the non-profit Global Solace, Inc. Lee Bristol has served as a mentor for EWB-UMD in the past and has traveled to Suma Ahenkro in Ghana to aid in the implementation of our water and solar projects. Dr. Peter Chang will serve as our faculty advisor for this trip and for the project. Dr. Peter Chang is one of our faculty mentors for the Engineers Without Borders Chapter at the University of Maryland. Dr. Chang is a professor in the Civil and Environmental Engineering Department. Dr. Jungho Kim will also serve as one of our faculty mentors for the project. He is the Director of Undergraduate Studies for Mechanical Engineering and is also one of our faculty mentors for the EWB-UMD chapter. Bryan Quinn, the Director of Technical Operations for the Institute for Research in Electronics and Applied Physics, will also be serving in a mentorship capacity. These mentors, along with other mentors, project leads, and students will serve as internal reviewers before designs are submitted to EWB-USA. The Project Lead for this project is Saheli Patel, a rising junior Mechanical Engineering student.

## Community Partners

Our main point of contact at Obrachere Secondary Technical School is the headmistress, Gifty Andoh Obrachire. We also have contact with Ransford, the head of the technical department at the school. Obrachire and Ransford, along with the two assistant headmasters, have decision authority. Northern California based Changing Lives Together (CLT) serves as the NGO. Lawrence Kumi, the in-country NGO contact, introduced EWB-UMD to the Obrachere community and worked with EWB-UMD with the Suma Ahenkro community.

## Reference Projects (Conducted by EWB-USA)

Amanfrom, Ghana Water Supply - Columbia University Chapter

The Columbia Chapter is working to develop a water source for Amanfrom to improve clean water accessibility and quantity. They decided to implement two boreholes to increase groundwater supply to the community. The community had two boreholes that were constructed in 2016, which were not successful in supplying water to Amanfrom. The boreholes failed to provide enough water supply to the community, and the location of the boreholes caused the people outside of proximity to rely on contaminated sources of water. The status of this project is currently “Under Construction” and has not been updated since Summer 2018.

<https://ewb-usa.force.com/VolunteerVillage/s/experience-expertise/a0I3600000Eq7iuEAB/amanfrom-ghana-water-supply-phase-2>

Sumaman Senior High School, Suma Ahenkro, Ghana - University of Maryland Chapter

The University of Maryland Chapter has completed an energy project in Sumaman Senior High school by constructing a photovoltaic system connected to a battery bank. This electrical system is successfully providing off-grid electricity to the school, allowing students to study regularly during any time of the day. This project was completed in January 2019.

<https://ewb-usa.force.com/VolunteerVillage/s/experience-expertise/a0I360000044WQgEAM/suma-ahenkro-ghana-energy-sumaman-senior-high-school>

Soroti, Uganda - Columbia University Chapter

The Soroti community in Uganda needed electrical energy to power their schools and for economic development. They plan to install solar powered generation systems that will operate on a pay-as-you-go system. This will require members to pay for their cost of electricity used, and will allow them to use pre-paid electricity. Batteries will be used to store electricity and controls will be utilized to manage flows of electricity in microgrid.

<https://ewb-usa.force.com/VolunteerVillage/s/experience-expertise/a0I36000004fJl1EAE/soroti-uganda-rural-electrification>

# Assessment Activities

## Partnership Formation

### Community Members

The team will conduct meetings with community members, including teachers, parents of students, community leaders, and other stakeholders, in order to determine what type of project is best suited for the community and to determine their support for a potential project.

### CBO Leaders

The team will meet with the leadership of the school to receive updated information about their needs. This meeting will be a significant contributor to the decision to choose what type of project to implement and an appropriate go/no go decision. The partnership agreement will be reviewed and if the school leadership is satisfied with the terms, the partnership will be signed.

### Local Government

Our NGO point of contact, Mr. Kumi will be working out a time for us to meet with the primary stakeholders in local government. The team will make the local government aware of what type of project is chosen for the community and determine expectations for how involved the local government will be with the project.

### Contractors

The team will enquire about the school leadership’s pre-existing relationship with contractors. This includes asking if they have a plumber and electrician working with the school and their expertise with pump systems and photovoltaic systems. The team will also ask the school mason if they have experience working with any contractors to build certain systems in the school, like the existing water tanks.

### Suppliers

The team will work with Mr. Kumi and the school leadership to find quality suppliers in Accra, Swedru, and Awutu Breku. Because of the previous project in Suma Ahenkro, Mr. Kumi and EWB-UMD have prior experience working with suppliers in Accra. Possible suppliers include solar vendors and general hardware stores. The team will ask if the school mason has a preferred supplier for tools.

## Project Feasibility

The first steps that must be taken to ensure the feasibility of any project in this

community is to confirm that the members of the community are willing to accept the

assistance of the EWB UMD team. In addition, we must also confirm the community is willing to provide labor for assisting in the implementation of the project the

EWB UMD has chosen and that the community will do their best to maintain the project implementation as long as possible and protect it from theft and/or damage. Lastly, depending on the type of project that is chosen, the EWB UMD team must receive confirmation regarding the project implementation from the authorities - such as the energy providers or water distributing organizations if they exist.

After this program feasibility has been determined, then the EWB UMD team must also ensure that feasibility of the actual project implementation. If a solar project is chosen, the team must decide if the community actually has a space free to use for building the solar project and if it is safe from damage. If a water project is chosen, the team must decide where the water will be treated and if it is possible for it to be distributed effectively to the entire community.

Lastly, it is essential that the EWB UMD team is able to determine if the community is willing to make repairs to the project implementation if something does indeed go wrong in the future. Furthermore, depending on the estimated cost of the project implementation, the EWB UMD team must also check with the community officials if they will be able to pay for future maintenance fees.

## Detailed Technical Data Collection

### General Data Collection

On the assessment trip, the team will gather both social and technical information to use for project decisions as well as project design. The team will find out more about the population, the landscape of school grounds, electricity use, water quality, construction possibilities, and the current sanitation situation. The main focus of the trip will be to gather data for possible water and energy projects, but the team will collect information regarding the possibility of construction and sanitation projects as well. The team will gather information through observations, technical measurements, and interviews.

The chapter will use semi-structured interviews to aid in generating a shared understanding of project criteria, constraints, and preferences between the community, the leadership council, and our team. Interviews will be conducted using a cell phone as a recording device and laptops to take accurate records of data collected. These interviews will first aim to gather more information on the demographics of the school including more detail about economic status, community resources, political organizations, and language skills. The team will also ask more in-depth questions about problems of the school, and have conversations with school leaders about possible solutions to these problems.

The chapter will use these interviews to ask about typical weather conditions throughout the seasons, the desired engagement of community members with the project, and about local resources for contracting and purchasing materials. Questions will be asked about the school’s financial, organizational, and technical capacity. Additional information will be gathered regarding local government, environment, and socio-cultural aspects of the school and the surrounding area.

The community’s financial capability will be evaluated using these interviews to determine the typical income of community members and evaluate the community’s capability to provide the 5% implementation contribution and maintenance costs in the future. Questions about primary form of income, fundraising done at the school, money management techniques, and operations and maintenance costs will be discussed with school leaders. For organization capacity, the team will speak with leaders about an already existing or future committee to be responsible for the operation and maintenance of the project. For technical capacity, the team will discover what technologies are known and familiar to students, school officials, and local skilled laborers. For environmental aspects of the school grounds, the project team will observe possible environmental impacts that a project may have on the surrounding area. For socio-cultural aspects, the team will need to find out about local social structures, and determine if a body exists that would veto a project of this kind. Additionally, the team will ask questions involving necessary permits and community relationships.

The chapter will collect data necessary for design as well as evaluate the logistics and feasibility of various projects types. The project team will visit and note local suppliers and determine the quantity, costs, and types of materials that are available and how they may be transported, stored, and tested. The various technical data that will be collected, specific to each project, is detailed in the following sections.

### Survey and Geospatial Data Collection

Topographical Surveying

The UMD Chapter of EWB plans on first doing a quick topological survey of the community. This can be done by using GPS to get a quick analysis of the region’s elevation relative to sea level. We can also use GPS to get an overview of the major geographical features nearby water sources such as rivers and lakes, hills, and major landmarks that will influence the implementation of a future water, solar, structural, or waste management project.

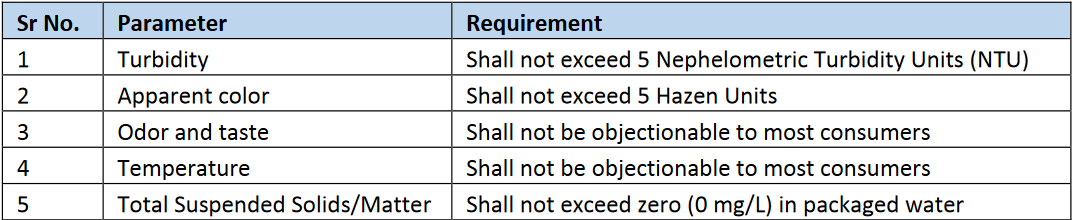
Site Surveying

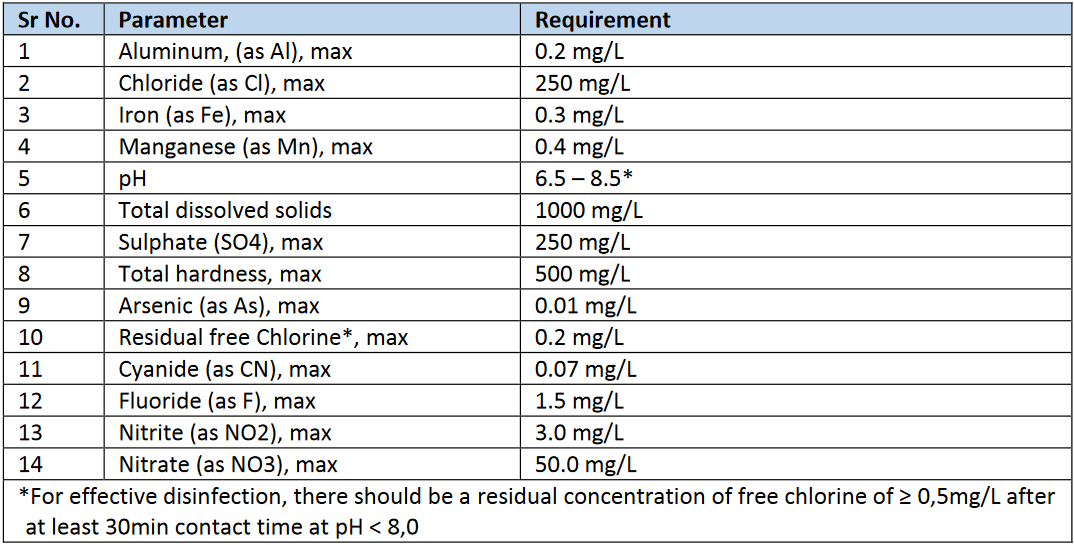
Depending on the projects being examined, there are different types of surveys that should be considered. For a solar project, there needs to be a survey that the regions near the community and how much sunlight they receive on a daily basis, as we should try to minimize the amount of shade. If a water project is being considered, then a survey to obtain the current mapping of water distribution across the community and the water sources used by the community. Lastly, if a structural or waste management project is chosen, then the EWB UMD must survey the existing landmarks and buildings that we are restricted from approaching for a project implementation. A goal of these surveys is to also gain some perspective on community guidelines that may act as constraints during the project implementation.

### Data Collected for Option 1- Water

For water quality, the team will test turbidity, total dissolved solids, presence of fecal coliforms, conductivity, arsenic and fluoride concentration, pH, temperature, nitrates, and chlorine. All of these parameters can be tested for using field kits without a lab.

Ghana Water Company, the majority provider of water in Ghana, defines physical and chemical standards for drinking water.





The school primarily sources their water from a borehole well, but during the dry season when the borehole doesn’t meet their water demands, students are sent to a creek 15 minutes away. In both cases, they don’t treat their water before consumption. They have a few water tanks, but we do not currently know any further details regarding water distribution. The team will determine the daily water demand ( water for drinking, cleaning, cooking, bathing), the seasonal flow rate of the borehole, the existence of contaminants in the water pipes and tanks, and how they dispose of water. While determining water demand, the team will ask a numerous people including the headmistress, teachers, and students, about their water usage to get a more complete estimate. The team will also be sure to get equal input from men and women about their water usage.

### Data Collected for Option 2- Energy

Assess Stability of Grid

The EWB UMD assessment team will first assess the current electrical conditions in the Obrachere Secondary Technical School. The team should keep in mind all the constraints given by the main electrical provider in Ghana. Specifically, the team will analyze the current stability of the electrical grid that the school relies on. The assessment team will speak to the local energy providers and the residents of the region in order to determine the average number of hours of electricity they have per day and how common power outages are on a daily basis. The team must consider if the community has a grid map or power lines that can be used to weigh the advantages or disadvantages of connecting to a grid.

Location Factors

The team must determine the geographical factors that may influence the decision in implementing solar panels. First it is essential to collect data on the average number of hours of sunlight per day. It is important that the team takes into account the weather conditions by season, for example if one season has significantly more or less sunlight than the other. This information can be determined from researching the yearly climate in the region. Another factor that must be considered is the quality and stability of the soil if the panels were installed on the ground. If the team is considering a solar project, an essential factor to consider is the best location without shade from nearby structures, and the team will make a list of ideal locations by monitoring different locations nearby the school at various parts of the day. Lastly, if a solar project is decided upon, the team must also consider the safety of mounting panels on the rooftop - the team should consult with experts in the community regarding the force a rooftop can support.

Load Analysis

The EWB UMD assessment team will also estimate the total power consumption of the electrical components in the school. In order to do this, the team must visit the school and its surroundings to compile a list of all the electrical components that use electricity. The team plans on using an international 240V Kill A Watt meter with an adapter to determine the total kWh of energy consumption for the entire school. The team must also acknowledge how the energy consumption of the school varies on a seasonal basis by talking with the school electricians or officials.

Cost Analysis

The EWB UMD team must perform estimations on the average cost that the school would have to pay on a set basis if they were connected to the grid and determine if implementing a renewable energy source would increase cost efficiency in the long term for the school. The team must make estimations regarding the total cost of the renewable project implementation and how much the school will have to compensate in the long run.

Project Maintenance

The EWB UMD team should also consider where they will store the charge controllers, inverters, and batteries if a solar project is chosen. For the long term, the team must consider the frequency of theft in the community talking with the police/authorities and also determine the best way to make sure the system is protected from weather and theft.

### Data Collected for Option 3- Sanitation

Latrines

Latrines function as a toilet or outhouse, especially in a community environment. Because of their constant use, they have the potential to be extremely unsanitary and can lead to the spread of numerous diseases. However, they serve to reduce the amount of human feces in the environment from situations such as open defecation, and also function to decrease the transfer of pathogens from feces to food via flies or other insects. Latrines are the number one target when dealing with sanitation in a community.

Analysis

To look at if the community is in need of changes in regards to latrines, we first have to understand the existing latrines. Data needs to be collected on how frequently the current latrines are used, pit sizing, wastewater management, piping materials, and what material is used to clean waste (toilet paper, tissue, paper towel, etc…). These depend also on the type of latrine, whether it is a simple pit latrine, or a latrine with flush capabilities hooked up to a septic tank. It should also be noted what the physical shape of the latrine is, and what the surrounding environment is like. The foundation and structure of the latrines should be taken into consideration as well. This includes talking to locals to see how many times the latrines have been repaired over the years, and what materials were actually used to construct the current latrines (concrete, brick, mud, etc…). This will allow for an understanding on how structurally sound the latrines are, and what changes need to be made. Lastly, the “shelter” of the latrine needs to be assessed. This includes its framing and how its built to determine structural integrity, and also ventilation. Ventilation is extremely important, where the latrine should, at a minimum, have a black vent pipe fitted to the pit, and a flyscreen at the top of the pipe. This redirects the smell via the chimney effect, and flies and other insects have decreased access. The shelter should have fly screen-fitted windows to ventilate even further. As a side note, occasionally coating the feces with absorbent decreases the smell and also serves to reduce the number of flies and other insects. As a basic guideline, the pit itself should be at least 2 meters above groundwater level, and 30 meters from the closest clean water source (community well).

Location/ Soil Conditions

The location of latrines are also important. This includes a basic mapping of the topography of the town, and finding out what the surrounding terrain is like. The importance of this isn’t so much for the latrines themselves, but for the safety and sanitation of the rest of the town. If a rainstorm were to come through, the latrines are at a risk of flooding. To prevent wastewater from coming into contact with the town, the latrines should be located where the water will flow away from the town, either naturally or by design. It should also avoid being located too close to the community well, because of the risk of groundwater pollution. This leads to determining local soil conditions to assess the risk of groundwater pollution. Although pathogens can die off while travelling through soil, some are still able to stay alive. The amount of pathogen that is able to reach clean drinking sources depends on soil type, aquifer type, distance that the pathogen has to travel, and other environmental factors. Besides pathogens, the soil can also impact the structural stability of the latrines. If the latrines are built in soil that isn’t very dense, the pits risk collapsing. Tests for this should also be implemented. As a basic guideline, the pit itself should be at least 2 meters above groundwater level, and 30 meters from the closest clean water source (community well).

### Data Collected for Option 4- Construction

Design Code - Become familiar with the Ghana building code (2018)

Site Survey- The assessment team shall gather the necessary data to create an accurate site plan, including but not limited to, existing structures, topography, vegetation, features such as roads and rivers.

Types and sizes of the following structural elements:

Roofing, walls, footing, columns, connections.

Floor plans of all the buildings that could possibly be the subject of a project.

Determine the materials used for certain structures or structural elements.

Analysis of those same materials used in the structures.

Geotechnical analysis of the natural elements that the structures are occupying (test pits).

Analysis of cement quality.

Accounting for any structural failures in components such as trusses, joists, panels, concrete, etc.

Load analysis of all components possible.

## Climate Change Data Collection

### Basic climate change questions:

In addition to the objective data found from research, ask the community these questions.

* + - Has it gotten hotter or cooler in the last ten years?

The average peak rainy season temperature rose from 79 to 81 from 2000 to 2010(most recent data available). The average temperature is expected to increase but at a slower rate for 2010-2020.

* + - Has there been a change in you drinking water supply in the last ten years?
      * If so how?
    - Have rainfall patterns changed in the last ten years?
      * If so how?

Rainfall has stayed constant over the past two decades. It has not differed by more than 50mm during that time

* + - Has the change in rain affected how you grow crops?
      * If so how?
    - Has drought impacted your community in the last ten years?
      * If so how?
    - Has a major storm(s) impacted your community in the last ten years?
      * If so how?

Flooding has heavily affected the surrounding areas of Accra in 2015 and 2016. Both years recorded floods that killed at least 25 and 10 people, respectively.

* The sources used to gather this information can be found here.

<https://climateknowledgeportal.worldbank.org/country/ghana>

<https://www.wunderground.com/history/monthly/gh/accra/DGAA/date/2000-7>

We will also be asking these questions to the community to assess the validity of this information.

### Additional Climate Change Questions

# Schedule

## Schedule overview

The first day of the assessment trip will be mostly introductions to the community and school administrators. The main focus of this first full day will be to collect as much verbal information about the needs of the school and the current troubles of the school. The travel team will meet with the Headmaster, Assistant Headmaster Academic, Assistant Headmaster Administrative, Head of Technical Department, and the School Mason. The team will also take a tour of the school grounds, and talk to the leadership about suppliers, status of plumbers and electricians, needs of the school, and government involvement in school funds and projects. Our team will also discuss EWB as a whole and more about how the partnership will work moving forward.

On day two, the project team will be focused around gathering detailed surveys of the school grounds and location. This will include both technical data collection and observations of the current grounds. The team will use GPS tools to gather elevation data of the entire school site. The team will also take pictures and make observations about the roof availability for solar panels, the structural stability of current buildings, and open space on the ground and within the property in order to find possible more space for solar panels.

The primary goal of day three will be to gather data for the possibility of a solar/power project. This will consist of collecting the data detailed in 2.3.4. The team will conduct a load analysis to find in detail what exactly the energy demand would be for different buildings and the school overall. Data also relevant to power such as daily sunlight and shadows in different locations, electrical/power regulations, and collect/put together a schematic of the current electrical system.

Day four will be focused on gathering information for a possible water project. This will first include water quality testing for the current water supply. Additionally, the team will conduct different soil tests to figure out the stiffness, quality, and type of soil on school grounds and in the surrounding area. The group will also inspect and map out the current water and water distribution system as well as the current latrines.

The fifth day of travel will serve as a buffer to finish any data collection that wasn’t done in the other four days. Local suppliers may also be visited if there are some near the school. This day will focus around a final question and answer session as well as a final meeting with school administrators to sign the community partnership agreement.

## Detailed schedule

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| **Day** | **Description** |
| Day 1 - August 11 | - Travel from Dulles Airport to Accra Airport |
| Day 2 - August 12 | - Arrive in Accra early in the morning  - Meet Mr. Kumi at airport, go to hotel to freshen up, and then source for materials in the city  - Everyone returns back to hotel in Accra for the night |
| **Materials to Source:**  Suma: Inverter chargers, wire, breakers if necessary  Obrachere: UPS system or solar panels and other necessary wiring (based on how we approach this project) |
| Day 3 - August 13 | **Obrachere**  - 3 travel members and 1 mentor will leave for Obrachere (approx. 2 hour travel time)  - Meet CBO leaders, students, and teachers and conduct informal interviews  - Get a tour of the school campus (including a walk through of all existing infrastructure, including PV systems, borehole well, computer labs, cooking facilities, storage tanks, etc.)  - Take notes and make sketches of the systems that are already there and ask questions to community members to clarify any questions  - If UPS system/solar panels were not purchased in Accra, look into options based on assessment of current cooking situation and figure out the best method of implementation  - At the hotel, go over information gathered and talk about steps forward for the next day |
| **Suma**  - 3 travel members and 1 mentor will leave for Suma (approx. 10 hour travel time)  - Go straight to hotel as it will be night time by the time they arrive  - Look over schematics for inverter charger replacement and prepare for the next day |
| Day 4 - August 14 | **Obrachere**  - If ready to install UPS system/direct PV system, two team members will work on this, while the rest of the travel team begins data collection  - If not ready for implementation, the entire team will travel to Water Works to determine the existing local government involvement in water distribution (tour of the facilities and interviews with employees) |
| **Suma**  - Introductions with school leadership and community members  - Two team members will begin work on replacement on inverter charger along with electrician  - Two team members will meet with Dominic (lead tech. chair) and begin troubleshooting the newer PV system that is also not functioning  - These technical projects should take the whole day and if we finish ahead of schedule, we can begin assessment of all implemented systems |
| Day 5 - August 15 | **Obrachere**  - Technical data collection related to surveying:  - Collect elevation data - probably using land surveying app on phone (two people needed, 2-3 hours depending on the size of school grounds and neighboring land that belongs to school)  - Map out roof and building sizes and make detailed sketches including appropriate dimensions (2 people needed, 3-4 hours)  - Analyze structural stability of current infrastructure (everyone can be working on this at the same time, 2 hours)  - Determine whether ground mounted or roof mounted PV system would be more beneficial (2 people, 30 min - 1 hour) - this should include interviews with community members about what they think would be most beneficial and least obstructive, also consider whether inclination of roof is safe to work on with advice from faculty advisor  - Conduct interviews - formal and informal - to gain community input about PV system and other options to address electrical needs, as well as any other info that can be gathered from these conversations |
| **Suma**  - Lee Bristol and Josh (most experienced with these systems) and the electrician will continue to work on replacement of inverter charger. If finished, unplug everything on this system and then walk the electrician through how to get the system functioning again with minimal supervision  - Begin/continue assessment of implemented systems (Dillyn and Quinn) - load analysis can only begin if the system is completely functional, so if both PV systems are not functional, they will work on this first  - Qualitative assessment can also occur during this time - (Dillyn and Quinn) ask electricians and workers in charge of upkeep of PV systems questions provided in Monitoring report (ask any follow up questions and get their input about how to better maintain and keep up communication with us during this time)  - Interviews with community members can also occur during this time - the purpose of this is to assess the sustainability of the systems and whether there are any gaps in terms of the systems operations of these systems. If there are gaps or unaddressed concerns, what can we do to address these problems  - At the hotel, go over day’s observations and notes from conversations with community members. Compile the concerns that seem most prevalent and analyze whether we can do anything now or in the future to address these issues |
| Day 6 - August 16 | **Obrachere**  - Continue working on mini-implementation to address cooking system power storage if not done (2 people needed, 2-3 hours depending on previous progress)  - Load analysis - Determine detailed information about how much power will be required for the buildings that would be powered with PV system (2 people needed, 3 hours)  - Load analysis - speaking to students, teachers, and other staff to determine the time that different electrical appliances are in use (2 people needed, 1 hour)  - Sunlight/shadow observations (1 person, throughout the day)  - Map out and observe electrical infrastructure and record all observations as well as including detailed sketches and descriptions when appropriate (2 people, 2 hours)  - Obtain existing documentation and schematics and address and points that are unclear (1 person, 30 minutes)  - Determine if the school has a designated electrician or any staff in charge of current PV systems and identify potential staff for this role if nobody is identified (1 person, throughout the day)  - Continue gathering qualitative data during down time from school community members |
| **Suma**  - If all systems assessment is complete, begin installation of data loggers. This will probably be done by Lee Bristol and Josh, with the electrician watching and understanding the process. Because there are safety concerns with this process, I would not have the electrician do this by himself.  - If systems assessment is not complete, continue with interviews and load analysis. Procedure for load analysis is in the monitoring document. (Load analysis should take approximately 3-4 hours, if all goes well, for each PV system and two people are needed to help with each system)  - Test battery drainage by measuring voltages and compare these readings to the voltages on the inverter charger display.  - Quinn and Dillyn will also focus on assessing the performance of the water projects. This will include interviewing the plumber and school members about whether the storage system is enough to supply them water during the dry season. We can also conduct water quality tests and check the pumps performance of the borehole well. |
| Day 7 - August 17 | **Obrachere**  - Conduct formal and informal interviews with community members and school leadership to determine most pressing need - water or power  - Begin considering the options to address one specific concern and identify any other additional information that is needed based on this analysis  - This will primarily be a qualitative information gathering day where all travel team members are conducting interviews with all stakeholders |
| **Suma**  - This day will be focused mostly on gathering qualitative data from students, parents, teaching and non-teaching faculty about what is/is not working, why it is/is not working, and what can be done about these things  - We do not have a list of formal questions to ask, however, we can come up with these if advised. The goal of this was to let the community members tell us what they are experiencing and then ask follow up questions to further understand what is going on.  - We hope to address minorities in the community who may not have a voice with the school/community leadership to get their input and see if we can do anything to address their concerns |
| Day 8 - August 18 | **Obrachere**  - Water quality testing (1 person, 1-2 hours, depending on how many water sources are being tested)  - Soil testing ( 1 person, 2 hours)  - Map of current water distribution system - this includes looking at sources of water, storage tanks, current borehole well locations, location of distribution source - also note and describe what the water is used for, how much is used, and what is the source of the water (from observation and from conversations with people) (2 people, 3-4 hours)  - Observe current latrines, including latrines themselves and the enclosement structure, and figure out more details about them (when were they installed, how often are they emptied, other pertinent information) (2 people 1-1.5 hours) |
| **Suma**  - Final check of data loggers and PV systems to make sure that inverter chargers are functioning properly  - Meet with the headmaster, electricians, plumbers, and anyone else who will be in charge of system maintenance and address any questions. Exchange contact info so we can maintain contact after the trip in case systems stop functioning again  - Wrap up any loose ends and complete last minute data collection/assessment  - This is a safety net day, so if there is nothing else to be done, venture into the neighboring town and continue to have conversations with people we meet |
| Day 9 - August 19 | **Obrachere**  - Meet with headmistress and other school leaders to finalize partnership and sign off on necessary documents  - Wrap up any loose ends and complete any last minute data collection that needs to be done  - This is a safety net day, so if there is nothing to be done, we can venture into the town and speak to community members to understand the scope of work for future projects, and the social, political, economic factors that may affect these future projects  - Travel back to Accra after leaving the community in the afternoon to meet back up with Suma travel team in the evening  - Stay at the hotel in Accra overnight |
| **Suma**  - Travel from Suma back to Accra (approx. 10 hour travel time)  - Meet back up with Obrachere travel team in the evening and stay at the hotel in Accra overnight |
| Day 10 - August 20 | - Travel from Accra Airport to Dulles Airport  - Assign tasks for post-trip report completion  - Post-trip debrief |

## Meetings with stakeholders

### Community Members

The meeting with the community will take place on the first day. The goal is to formally introduce the team and the community, and to better understand the community’s needs. The team will also set expectations regarding the scope of a potential project and go over the agenda for the week, reorganizing if necessary. Throughout the trip, the team will survey community members about their experiences with power outages and water availability to better understand their priorities and needs.

### CBO Leaders

The first meeting with the school leadership will be the first day we are in the community. The goal of this meeting will be break down the needs of the community and to tour the current school grounds. We will gather information from the school administration regarding financial information and government involvement with the school. The team will also ask about current water and power situations. These questions will include details such as water allocation, blackouts and brownouts, current water treatment, and current costs. This meeting will be used to find what the leadership thinks is the most pressing problems currently at the school. A final question and answer session will also be conducted at the end of the week to run by the data the team has gathered and preliminary thoughts on possible projects.

### Local Government

Our NGO point of contact, Mr. Kumi will be working out a time for us to meet with the primary stakeholders in local government. We are unsure of when these meetings will occur and will most likely only know upon arrival to the community.

### Contractors

Meetings with contractors will be held on the first and last days in the community. These meetings will be with the school mason and school electrician (if they have hired one yet). The goal of these meetings will be to gather technical information and guidance from an in-country skilled contact. The team will ask questions about buildings and power according to their expertise. Additionally, the team will travel to Water Works, the company with the reservoir, in order to ask more questions about the water they provide to the school. This will be done on the last day we are in the community.

### Suppliers

The team will visit local suppliers on the last day, day 5, of the visit. Because of our work in Ghana on previous projects, our team is familiar with some suppliers that are local and in the capital area. We will visit new suppliers close to the community and document the types of products they have for purchase.

## Engineering Data collection

Engineering data collection will take place on the 5th and 6th days of the trip. After further surveying on the 7th day, more data will be collected. This includes baseline data collection as noted in 3.6. Engineering data will include elevation data, roof and building size mapping, structural stability analysis, figuring out where solar panels should be placed for maximum effectiveness, and a detailed load analysis of each building.

## Community Surveys

The majority of the surveying will be conducted within the first day after arriving in Obrachere (day 3 relative to the entire trip). We will be asking simple questions to community leaders, and current residents regarding their comfort and what they feel needs to change. After data collection, we will further engage residents with more questions depending on the various findings. This will take place on day 7 relative to the total time of the trip.

## Baseline Data Collection

Baseline data collection will happen starting on the 7th day, and will carry over onto the 8th day. The entirety of the 8th day will be dedicated to said data collection. This data will cover water quality testing, soil testing, mapping the current water distribution system, and observing the various latrines on campus.

# Go/No Go Decision

Community ownership

- Go:

The community signs documents indicating that they are willing and able to pursue a project at the school to improve the health, education, and well-being of the students and faculty. The travel team will continue as planned if the community is still committed to the project.

- No Go:

The community determines that they do not want to continue with the project or

that there is no need for any project. Design and implementation would cease after

this decision.

Community capacity

- Go:

-The community members express a financial commitment to the project consistent

with EWB guidelines and establish clearly that they will be able to provide lodging,

food, and transportation for our travel teams over the project timeline. Additionally, the community members have the financial ability to contribute a percentage of the project funds as well as pay for operations and maintenance.

- No Go:

The school decides they would not like to allocate funds to the project or that the project would disrupt the community in such a way that a majority of community members would prefer the project does not continue.

Potential for participatory approach

- Go:

The community is willing to work and collaborate with our team during the assessment, design, implementation, and monitoring phases of the project. This involves contributing ideas, giving input, and being responsive.

- No Go:

If the community and school employees are unwilling to provide labor for construction and/or maintenance of these projects. Additionally, the community is unwilling to identify and obtain resources for construction and unwilling to answer relevant questions necessary for the project design.

Capacity of partners/NGOs

- Go:

The NGO partners are willing to commit to the entire timeline of project phases, and work with and communicate to the community on the chapter’s behalf, especially when the travel team is not present.

- No Go:

The NGO partners decide they do not have the time, resources, and/or interest to

maintain a strong level of engagement with the project over its lifetime.

Technical feasibility

- Go:

Professional technical mentors are available to guide data analysis, assessment, design, implementation, and monitoring. These professional members should have relevant experience in civil, structural, environmental, and geotechnical engineering, and should be familiar with principles of international development.

- No Go:

If the professional mentors are unable to provide sufficient support to the chapter, the chapter will consider whether projects can be properly designed and implemented. Additionally, a lack of resources and/or equipment in the area may prevent construction and/or require alternative designs to be considered.

Health and safety

- Go:

There are no CDC, Department of State, ISOS, or university high-risk advisories in the area that would put team members in danger. The safety and wellbeing of the team members will not be at risk by traveling to the community in Ghana.

- No Go:

High-risk advisories in this area would be heeded during travel times, and trips

would be postponed until travel is safe. The safety and/or wellbeing is at risk when the travel team is present in the community or traveling there.

## Other Factors Contributing or Hindering Development

Currently, the community is supplied with fresh water from a nearby facility just a few miles up the road. However, it was recently discovered that there isn’t a constant water supply coming to the community, rather it is being shared between a few different communities. This means that the residents don’t have clean drinking water 24/7, but only during certain parts of the day. While this doesn’t exactly hinder development, it is important to consider when dealing with how water is distributed in the community. From what is known at the moment, there are no further factors hindering development. In fact, it was noted that the government has been assisting the community, such as installing solar panels for one of their computer labs. In regards to fires, earthquakes, drought, and conflict, the only main concern would again, be with water. During the dry season in Ghana, boreholes are rendered useless, so the community is forced to rely on the water distribution company.

# Baseline Monitoring Data Collection

## Baseline Data

Before the Assessment Trip:

* The chapter will have selected a project category from one of EWB-USA’s standard project categories the project record is created.  Once selected, Volunteer Village will auto populate the PMEL record containing the PMEL questions associated with that project category located on the technical plan record. The beneficiaries are stored on the project record. These same questions will be used throughout the project process to gather pre and post construction data.
* *The chapter should review the PMEL questions and adjust their field activity plans so they have the time and the proper equipment to answer the PMEL questions.*The chapter may need to train the community to complete some PMEL activities when the chapter is not in the community (i.e. water quantity information in the rainy or dry season).
* *The chapter should download the questions and copy them as an attachment to their pre-trip plan.*

During the Assessment Trip – **Baseline Data Gathering**

* As the chapter conducts its physical data gathering in the community, they should ask the community members the questions associated with the project being contemplated for the community. The answers to the questions will be used to set the project **baseline (or pre-project) condition**.
* The chapter should also conduct any testing or physical data gathering required by the questions.  The chapter should record the answers to the questions and the results of the testing in their field notes.
* *Fill out the community survey the project lead will be able to create the survey following the instructions in Volunteer Village.*

## Beneficiary Analysis

The beneficiaries on this trip are mainly going to consist of current students. This is because Obrakyere is a secondary technical school, and the student count is fairly high. At the moment, the numbers from various documents indicate that there are currently 1347 students attending. 611 of these students live at the school, while 736 students commute. The number of teachers is unknown, but we do know that there is a Headmaster, two Assistant Headmasters, and a Head of Technical Department. Of course, things can change, so a more accurate count will be taken upon arrival. Again, however, the main beneficiaries are going to be Obrachere students.

# List of Attachments

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#### Attachment A: Partnership Agreement