Borehole Drilling for Adi-Gulti Community

Central Zone, Tigray, Ethiopia

Funding Sources

Central Highlands Foundation
Rotary District 5440
Rotary Club of Fort Collins Breakfast, Colorado, USA
The Murulle Foundation

Proposed By

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1 Executive Summary

This proposal outlines a project to drill a borehole for the community of Adi-Gulti, located in the Wereda Maikinetal of Tigray Province, which serves a population of approximately 6,750 people. The primary objective is to provide a sustainable and reliable source of potable water to the community, addressing the critical issues of scarce surface water and improving public health.

2 Background

The lack of an adequate potable water supply critically impairs the ability of the population to live meaningful and productive lives due to the occurrence of debilitating diseases. Most of the preventable diseases that occur in the country are the result of the lack of safe water and proper sanitation. Moreover, the time and energy spent on the collection of water is unsustainable for most of rural Ethiopia and certainly is true in the subject location.

Despite considerable efforts of governmental, local, and international development actors to expand water supply and sanitation services to the ever-increasing population, the coverage achieved has been extremely inadequate due to budget, manpower, and technological constraints. The Ethiopian population is estimated to increase annually at a 3% growth rate, while the investment in a safe water supply is far less. Additionally, due to the relatively high investment required for an adequate water supply system, local governments tend to allocate their limited budget to other sectors. Typically, the annual budget allocated for water supply is only for the maintenance of existing schemes. Therefore, most Ethiopians do not have access to safe and adequate drinking water.

This situation has negatively affected the productivity of farmers as well as the physical, social, and psychological state of women and children, especially girls. It is usually girls in the family who engage in fetching water from distant sources at the expense of their time for schooling. This also endangers their health due to frequent long distance travelling on foot carrying the water. Collecting unprotected water with a container that holds 5 gallons is a major activity in their daily lives for women and children in the project area. Carrying such a heavy weight on the head, back, or hips has severe health implications for women and children. Children, especially girls, are required to help their mothers with water collection and other domestic tasks. In most families one or two children are assigned to gather water for watering the livestock. The girls are left with limited time to attend school and no time to play.

This document is meant to propose implementation of the Adi-Gulti project to promote access to a safe water supply, environmental sanitation, and personal hygiene practices for the people of the community.

3 Project Objectives

Access to an adequate, safe, and affordable supply of drinking water is universally recognized as a basic need. The provision of improved water supply services benefits the people through betterment of health status, saving time and effort, and enhanced productivity. The overall aim of the intended project is to bring a sustainable improvement in the socio-economic wellbeing of the people in the project area. Upon completion of project implementation, the following objectives will be met:

- Drill a borehole that provides safe and clean drinking water to 6,750 people of Adi-Gulti.
- Reduce the incidence of waterborne diseases by ensuring access to potable water.
- Promote community involvement and ownership of the water resource.
- Improve the health of the community by providing safe and adequate drinking water and improving sanitation and personal hygiene.
- Reduce the burden of women and children by providing piped water at a convenient location.
- Strengthen the awareness and skill of the community to effectively utilize and manage natural resources.

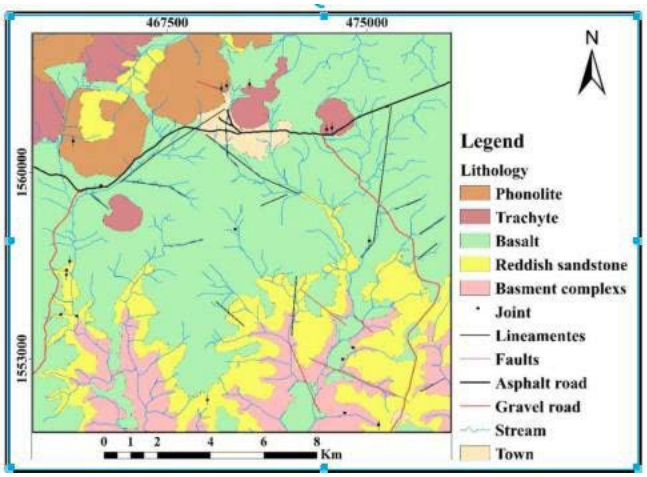
4 Project Description

4.1 Location

The proposed borehole is situated within the jurisdiction of Tabia Adi-Gulti in Woreda Maikinetal, which is part of the central administrative zone of the Tigray Region. Tigray is in the northern part of Ethiopia and borders the country of Eritrea. The location is adjacent to the highway that links Mekelle and Adwa, approximately 145 km northwest of Mekelle. Its proximity to Maikinetal, the main town in the Wereda, enables the development to utilize the existing social infrastructure including access to electricity, roads, and professional and logistical support. Additionally, Maikinetal, located about 10 km southeast of the site, has been recognized as a source of limited support. The geographical coordinates of the site is 13°57'03"N 38°56'30"E (link: https://earth.google.com/web/@13.95250338,38.94168727,1910.79863086a,1623.66537431d,35y,0h,0t,0r/data=CgRCAggBSggIoeeYmgYQAA)

The study area presents a diverse topography, featuring both flat regions and mountainous terrain with elevations ranging from 1,900 to 2,500 meters above sea level. The northern, northwestern, and southwestern sections are characterized by mountainous and hilly landscapes, while the southern and southeastern parts exhibit gentler topography. The slope gradient in this area varies significantly, encompassing both gentle and steep hill slopes.

The hydrology of the region is influenced by streams that originate from the surrounding highlands. These streams are more densely distributed in areas with higher slopes, while they become sparser in flatter regions. The drainage pattern is predominantly dendritic, with numerous tributaries flowing from the northeastern and northwestern areas towards the southern and southwestern parts of the study area. This combination of elevation, slope, and drainage patterns contributes to the unique ecological and hydrological characteristics of the region.
The geology of the study area consists of various rock types and geological formations. It encompasses Precambrian basement complexes, Mesozoic sedimentary rocks (primarily undifferentiated clastic sedimentary rocks, predominantly reddish sandstone), as well as basaltic rocks and trachyte and phonolite plugs, ranging from the oldest to the youngest formations. The Precambrian basement is made up of low-grade metamorphic rocks that are highly weathered, fractured, and sheared, displaying a variety of colors including light grey, dark grey, and light green. These rocks generally trend in a NE-SW direction. The area's sandstone is noted for its reddish hue, significant weathering, and fracturing, covering 18.1% of the study region. The most prevalent rock type exposed is basaltic flow, which shows textural and compositional variations, along with layers of thin red Paleo-soils within the sequence. Some basalt formations exhibit a fresh black color and a light brownish weathered appearance, with fine grain size, massive structure, and in some areas, notable fracturing, and extensive weathering, as well as columnar jointing. The trachyte and phonolite rock units appear as distinct irregular dome-shaped formations that create elevated areas. Trachyte is characterized by a bright white to whitish-gray fresh appearance, moderate weathering, and a hard, compact, massive structure, while phonolite is identified by its dark gray to pink coloration, coarse grain, and extensive weathering and fracturing due to jointing. The phonolite commonly features closely spaced vertical joints and exfoliation weathering.



4.2 Methodology

• **Conduct a hydrogeological survey to confirm the best drilling location:** A hydrogeological survey is a critical first step in identifying the most suitable site for drilling a borehole. This survey involves assessing the geological and hydrological characteristics of the area, including the types of soil and rock formations, groundwater levels, and flow patterns. By utilizing techniques such as geophysical surveys, soil sampling, and water table measurements, experts can determine the presence and quality of groundwater resources. This survey was conducted by Solomon Kidanu of Axum University and Dr. Asmelash Abay, a hydrologist and professor at Makelle University. The survey was performed in April of 2025 utilizing a PQWT 150 Underground Electric Water Detector, an instrument accurate to 160 meters in detecting the presence of underground water. It was determined that the most appropriate site for the well drilling was on the campus of the Adu-Gulti Primary School. The well will need to be dug to an approximate depth of 130 meters, at which location an adequate supply of water was detected. Permission has already been granted by local education officials to use the projected site on school grounds at no additional land cost. The Adi-Gulti school is comprised of over 1,200 students in grades 1-8 with a staff of 12 teachers and a principal. The site is central to the community and is optimal in terms of limiting travel distance for residents.

• **Engage a qualified drilling contractor to carry out the drilling process:** Once the optimal drilling location has been identified it is essential to engage a qualified drilling contractor with experience in borehole drilling. The contractor should possess the necessary licenses, certifications, and equipment to perform the drilling safely and efficiently. It is important to review the contractor's past projects and references to ensure they have a proven track record of successful borehole installations. The contractor will be responsible for mobilizing the drilling rig, conducting the drilling operation, and adhering to safety and environmental standards. Effective communication between the contractor and the project stakeholders is crucial to address any challenges that may arise during the drilling process. There are several qualified drilling contractors in the vicinity of the site and the selection process will rely on competitive bidding among all interested parties with the final selection being made by Mr. Solomon and Dr. Abay in conjunction with the local water committee.

• **Install a pump and storage system to ensure efficient water distribution:** After successfully drilling the borehole, the next step is to install a pump and storage system that will facilitate the efficient distribution of water. The selection of the pump should be based on the depth of the borehole, the expected yield, and the specific water needs of the community. A properly sized storage tank is also essential to ensure a reliable supply of water, especially during peak demand periods. The system should be designed to minimize energy consumption and maintenance requirements. Additionally, incorporating filtration and treatment systems may be necessary to ensure the water quality meets health standards. This infrastructure will enable the community to access clean water consistently and sustainably. Since there is a reliable source of public electricity at the proposed site the pump that will be utilized will be a submersible three phase 5 horsepower

electric pump. This will be more than enough to supply water from an estimated 130-meter depth. The installation of the storage tank, or Roto, as well as all necessary connections, will be done by professional contractors who have worked previously with Mr. Solomon on other water projects.

• **Implement a community management plan to oversee the operation and maintenance of the borehole:** To ensure the long-term success of the borehole project, it is vital to implement a community management plan. This plan should involve local stakeholders, including community members, leaders, and relevant organizations, to foster ownership and accountability. The management plan should outline roles and responsibilities for the operation and maintenance of the borehole, including regular monitoring of water quality and quantity, routine maintenance of the pump and storage system, and addressing any issues that may arise. Training community members in basic maintenance and troubleshooting can empower them to take an active role in the management process. Additionally, establishing a financial plan for ongoing operational costs, such as repairs and electricity, will help ensure the sustainability of the water supply for years to come.

By elaborating on these points, we can see the comprehensive approach needed to successfully implement a borehole project that meets the water needs of a community while ensuring sustainability and effective management.

4.3 Community Involvement

The project aims to actively engage local community members throughout the implementation phases thereby fostering a sense of ownership and responsibility for the borehole initiative. Involving the community is crucial for ensuring the long-term sustainability of the project, as it encourages local stakeholders to take an active role in its success.

Community Involvement in Implementation Phases:

• **Stakeholder Engagement:** From the outset, community members will be invited to participate in discussions and planning sessions. This engagement will help identify their specific needs, preferences, and concerns regarding the borehole project. By incorporating their input, the project can be tailored to better serve the community.
• **Formation of a Management Committee:** A management committee composed of local representatives will be established to oversee the project's implementation. This committee will be responsible for coordinating activities, facilitating communication between stakeholders, and ensuring that the project aligns with community goals. This committee will be responsible for the monthly electric charges as well as normal maintenance and operation expenses.

• **Monitoring and Evaluation:** Community members will be involved in monitoring the progress of the project. This includes regular assessments of the borehole's performance, water quality, and user satisfaction. By participating in evaluations, community members can provide valuable feedback and suggest improvements, fostering a sense of shared responsibility.

• **Training on Operation and Maintenance Comprehensive Training Programs:** To ensure proper usage and maintenance of the borehole, training programs will be developed and delivered to community members. These programs will cover essential topics such as the operation of the pump, water quality testing, and routine maintenance procedures.

• **Hands-On Learning:** Training will be conducted through hands-on workshops, allowing participants to practice the skills they will need in real-life scenarios. This practical approach will enhance their understanding and confidence in managing the borehole effectively.

• **Establishing a Support Network:** In addition to initial training, a support network will be created to provide ongoing assistance to community members. This network may include local experts, project staff, or representatives from relevant organizations who can offer guidance and troubleshooting support as needed.

• **Empowerment through Knowledge:** By equipping community members with the knowledge and skills necessary for the operation and maintenance of the borehole, the project empowers them to take ownership of the water resource. This empowerment is vital for fostering a culture of sustainability, as community members will be more likely to prioritize the care and management of the borehole. In summary, involving local community members in the implementation phases of the borehole project is essential for ensuring its sustainability and fostering a sense of ownership. By providing comprehensive training on the operation and maintenance of the borehole, the project not only enhances the community's capacity to manage their water resource effectively but also strengthens their commitment to its long-term success. This collaborative approach ultimately leads to a more resilient and self-sufficient community, capable of addressing its own water needs.

This budget provides a comprehensive overview of the financial requirements for the borehole drilling project, breaking down the costs into specific components to ensure clarity and transparency. Each item listed in the budget represents a critical aspect of the project, allowing stakeholders to understand where funds will be allocated and the rationale behind each expense.

5 Budget

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The cost of $18,052 for the drilling operations represents the primary expense of the project. It covers the actual drilling process, which involves specialized equipment and skilled labor to reach the desired depth. This component is crucial for establishing a reliable water source. Acquisition of a submersible pump and installation are priced at $2,116. This expense includes the purchase and installation of a submersible pump which is necessary for extracting water from the borehole. The

pump's efficiency and reliability are vital for ensuring a consistent water supply. Both costs are provided by professional drilling companies based on the information provided to them and their experience with similar projects in the area. The final cost with be determined through competitive bidding processes.

The miscellaneous cost of $1,700 is essential for assessing the geological and hydrological conditions of the site and will be paid for with non-Rotary funds. It will be used for past and future expenses of conducting the survey. The survey helps identify the best location for drilling, ensuring that the borehole will yield sufficient water and meet the community's needs.

By detailing each component and its corresponding expense, this budget not only facilitates effective financial planning but also promotes accountability among stakeholders. It allows for informed decision-making and helps ensure that the project remains within financial constraints while meeting its objectives. Overall, this structured approach to budgeting is essential for the successful implementation and sustainability of the borehole drilling project.

Rotary Funded Budget Items			
Item	**Quantity**	**Unit Cost $**	**Subtotal Cost**
Borehole Drilling	130 meters	$160	$18,052
Submersible Pump	1	$2,116	$2,116
Water Storage Tank (Roto)	1	$975	$975
Water Storage Tank (Roto) Stand	1	$1,695	$1,695
Accessories (pipes, clectric cable, etc.)	1	$2,550	$2,550
Sub-Total			**$25,388**
Non-Rotary Funded Budget Items			
Item	**Quantity**	**Unit Cost $**	**Subtotal Cost**
Professional Expenses and Transportation	1	$1,700	$1,700
Sub-Total			**$1,700**
Project Grand Total			**$27,088**

6 Funding Sources

We seek funding from the Central Highland Foundation to partially cover the costs associated with this project. The Central Highland Foundation is a non-governmental organization based in the United States which is involved in funding water projects for remote and highly vulnerable communities in Tigray and in other regions of Ethiopia. The Central Highlands Foundation has had experience working with Mr. Solomon on a previous water project in Tigray in 2024 which produced clean water for a community of nearly 1,900 people. Mr. Solomon has also been instrumental in helping the Central Highlands Foundation to provide computers and audio-visual equipment to several schools in the area.

We are hopeful that District 5440 of Rotary International will provide District Distributed (Matching) Funds providing a 2:1 match for funds from the Rotary Club of Fort Collins Breakfast.

We also expect The Murulle Foundation, based in the United States, will also provide funds for this project.

We expect funds will be moved from the Rotary Club of Fort Collins Breakfast's Charitable Foundation to the Myshum Charity organization (non-religious and non-political charitable organization). Distribution of funds from the Myshum Charity organization will be directed by Mr. Solomon and Dr. Asmelash Abay. The funds could also be moved through the Rotary Club of Mekelle but Mekelle is about 140 miles from Axum and this would make it more difficult for Mr. Solomon to receive the funds which will be paid in increments.

7 Expected Outcomes

- Improved access to clean drinking water for approximately 6,750 residents of Adi-Gulti.
- Decreased rates of waterborne diseases.
- Strengthened community capacity for managing local water resources.

8 Conclusion

The proposed borehole drilling project represents a vital step toward improving the quality of life for residents of Adi-Gulti, Wereda Maikinetal. By providing access to potable water, we can foster healthier communities and promote sustainable development. We kindly request your support in making this project a reality.