

# TEST WELL DRILLING: GARDEN WATER ACCESS

## FOR THE SCHOOL OF SCIENCE, ENGINEERING, AND HEALTH SYMPOSIUM DAY

Aaron Film, Marcus Upton, David Wilson

### Introduction

In Western Africa there is a need for water to irrigate vegetable gardens during their dry season. The Garden Water Access Project has worked to produce drilling equipment and a pump for this purpose. This year we focused on using our drilling rig to drill several test wells locally.



### Clients

#### Matt Walsh with Open Door Development, SIM

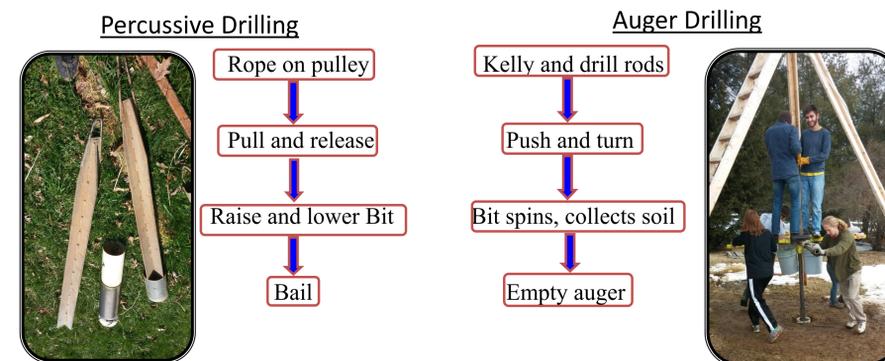
Matt Walsh was the first Collaboratory Manager. Now he is a missionary with Serving in Missions (SIM) in Burkina Faso.

#### Open Door Development

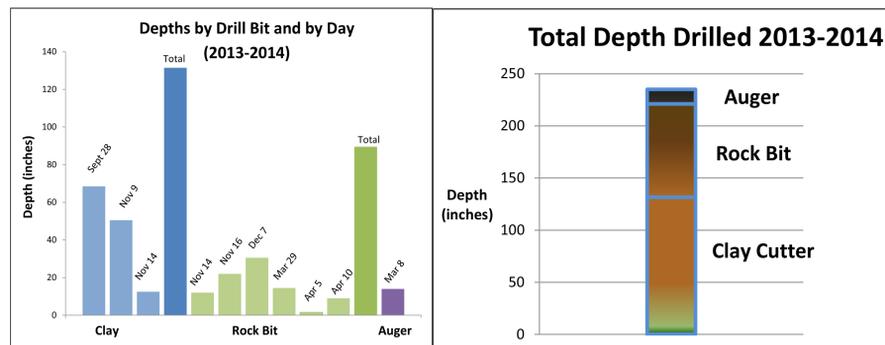
ODD is a new SIM community development ministry based in Mahadaga, Burkina Faso. Their mission is to share the gospel by equipping the local church for community service and by ministering to human needs. ODD was officially founded by Dale Johnson and Matt Walsh, in 2012.

### Results

We made substantial progress at our two site locations using both percussive and augering hand-drilling techniques. Our data and processes were carefully recorded and analyzed to determine the effectiveness of our drilling systems.



Our total drilling depth between the two sites was about 235 inches. At the end of our testing the borehole on Messiah's campus was approximately 12 feet deep.



### Further Information

Visit our page on the Collaboratory Wiki:

[http://www.thecollaboratoryonline.org/wiki/WA:Garden\\_Water\\_Access\\_Project](http://www.thecollaboratoryonline.org/wiki/WA:Garden_Water_Access_Project)

Attend our presentation: Garden Water Access Project at 1:40 in Frey 110

### Bailer

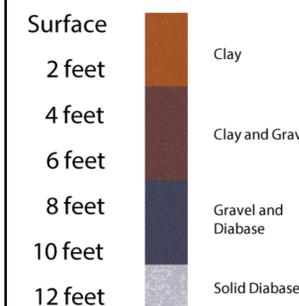
A bailer is a pipe with a cap and flap on one end with the other end open. When the bailer is dropped down the hole a mixture of water and soil particles push past the flap. The contents are brought to the surface and then emptied. This semester we worked to improve our bailing efficiency by designing and building a PVC bailer. After initial testing, we added weight to the PVC bailer using stainless wire rope as shown in the picture. Additionally, we modified the flap by removing a rubber seal and sanding down some edges on the inside.



### Soil Composition

Diabase is low grade titanium ore. It is not commercially used because it absorbs water and freezes. This leaves it in round, semispherical nodules. It is very hard. Most hand-powered drilling systems cannot penetrate it. We encountered large amounts of diabase in our drilling sessions this year.

### Soil Type Depth Chart



### Hard Surfacing

When encountering diabase with our rock bit the soft steel could not withstand the impact, as shown in the top picture. Instead of remaking a new bit out of harder steel we decided to coat the sharp edges with a welded layer of harder metal, a process called hard surfacing. As a result the rock bit has been able to withstand extended drilling through diabase.



### Conclusions

Overall, our testing demonstrated that the bits function well in their intended materials. The clay cutter progressed rapidly through clay soils and the rock bit slowly drilled through even the most difficult materials such as diabase. Although there were numerous challenges, our devised fixes largely resolved the problems. Our techniques and solutions will be applied during a site team trip to Mahadaga, Burkina Faso in May 2014.

### Acknowledgements

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