

Corrie Kavanaugh

Class of 1995 Grant Report

Engineers Without Borders – La Pitajaya Water Project

Overview/Project History:

Engineers Without Borders – Princeton University is a student-run chapter of the Engineers Without Borders-USA dedicated to designing sustainable engineering solutions in order to address issues in developing communities around the world. The Potable Water System Project established by the Peru team of EWB-Princeton sought to establish a strong partnership with the community of La Pitajaya, Peru in order to accomplish their goals of community improvement. Specifically, our project aimed to address the areas of health and sanitation in La Pitajaya by providing clean drinking water to the community.

The water pipeline project began in 2011, when a team of Princeton students traveled to the town of Samne, in the region of La Libertad in northern Peru, in order to assess the potentiality for future projects in the region. While there, they were approached by members of the nearby village of La Pitajaya, who requested aid in obtaining clean water for the community. Prior to our partnership with La Pitajaya, members of the community had been drinking water from a canal that was heavily polluted with mining waste and raw sewage, or were forced to walk nearly two hours to find a clean source of water.

In light of this trip, our team decided to partner with La Pitajaya to realize their goal of obtaining clean water. To this end, the team decided to build two gravity-fed water pipelines; one in the upper (or Alta) part of the community, and one in the lower (Baja) part of the community. The Alta water pipeline was completed in the summer of 2013, and the Baja pipeline was

completed in the summer of 2014, bringing potable water to the entire community for the first time.

The goal of this past summer's trip was to monitor, evaluate, and close out the project in La Pitajaya, and visit new communities in the surrounding area that still do not have access to clean water in order to search for a community to partner with for our next project. After this summer, the team has successfully closed out the project in La Pitajaya, and is now in the process of evaluating communities that we visited while in Peru in order to choose which community we will be working with for our next project.

Monitoring and Evaluation

During our first few days in Peru this past summer, the team spent an extensive amount of time walking and evaluating the two pipeline routes that we had built in La Pitajaya, in order to collect data needed to close out the project and ensure that everything in the systems was working properly. This monitoring included taking water quality testing samples, taking flow rate measurements, and checking the pipeline and system components for any issues. Overall, both systems were in very good condition, and were functionally in bringing water to the community. However, a few modifications and repairs were made in order to ensure the long-term sustainability of the pipelines. At the end of this process, the community acknowledged that they were now in complete ownership of the two systems, and agreed to close the program in their community.

Repairs to Alta Pipeline

While monitoring the Alta pipeline, the team was notified by the community that the flow rate in the system was unusually low. An inspection of the source capture (the point at which

groundwater is captured and fed to the system) revealed that some water was leaking out of the source without being fed into the system. Furthermore, the concrete collection box where water was filtered and the 1" pipeline from the source to this box were both too small to accommodate the amount of water flowing from the source during the wet season. In order to amend these problems, the team made modifications and repairs to the source capture, changed the first 200m of pipe from 1" to 2" diameter, and rebuilt the collection box with larger dimensions. This solution helped to increase the flow of water to the community.

During our time here, the community was approached by an elderly woman who lived along the pipeline and did not have access to clean water and asked if she could be added to the system. The community agreed and asked if we could help build the tapstand so that the new user could have access to water. The team agreed, and added the new house to the water system.

Additionally, the team made minor repairs to other tapstands, inserted shutoff valves along the system so that the flow of water could be stopped if repairs needed to be made, and sheathed an exposed section of exposed PVC plastic pipe in galvanized pipe in order to protect it from rock falls and fires in the area.

Repairs to Baja System

The inspection of the Baja pipeline revealed that the system was in excellent condition, with only minor repairs that needed to be made. Like in the Alta system, the flow rate of water in the system was a little low. The team inspected the source, and found that the entirety of the original water source had not been fully captured by the system. In order to accomplish this, the team expanded the source capture so that it encompassed the entire source, thereby increasing the flow of water through the pipeline.

Additionally, there is a section of the pipeline that is supported on concrete piers. We found that a few of these piers had started to crack. In order to stabilize this part of the pipeline, we expanded the concrete piers in order to increase their long-term durability.

Visiting New Communities

As mentioned earlier, the second goal of this trip was to assess new communities for future projects. To this end, our team collaborated with a Peace Corps volunteer in the municipality of Otuzco. Over the course of last year, our contact traveled to 70 communities in the municipality where we work that lacked access to clean water, and created a list of 7 of these communities, which we visited while in Peru. In these meetings, we met with village leaders to discuss the needs of the community and assess the technical feasibility of a project in the area. In all of these communities, clean drinking water was by far the greatest necessity. As such, our team has decided to work on building another water pipeline for our next project. Of the seven communities that we visited, three had partial access to water systems, while four had no access to clean drinking water whatsoever. For this reason, our team has decided to focus on the four communities that do not have any access to potable water. While in Peru, we collected preliminary elevation, GPS, and flow rate measurements of the sources for each community. Now, we are in the process of assessing the feasibility of each project, and deciding which community we will partner with in the upcoming year.

The team plans to finish its analysis of the communities that we visited and pick a community to partner with by December. After this, we will begin making plans and obtaining the legal permissions needed for our new project. This summer, we will return to Peru in order to conduct an extensive survey of the proposed pipeline route and collect the data necessary to design the water pipeline over the next academic year.

La Pitajaya Alta Source Capture Work



Original Alta Source Capture



Clearing of cement and rocks in source capture



Discovering inlet pipe is clogged with roots and mud



Construction of walls to block growing roots



Installation of new source capture inlet pipe with filters



Valve box added in case of maintenance work



View into the access point constructed for maintenance



Access point cover protected with lock and chain

Alta Spring Box Work



Original Alta Spring Box



Inside view of springbox



Rebar framework for new larger springbox



Concrete molding for springbox



Our mason Oscar next to a nearly completed springbox



Inside view of new springbox

New User Added



Existing system (little to no flow) Rebar framework and tapstand mold being filled with mixed concrete



Nearly finished tapstand now connected to the La Pitajaya water system



Completed tapstand

Pipeline work in La Pitajaya Alta



Expansion of source capture in La Pitajaya Baja



Galvanized pipe with concrete dados around curve Inlet pipe for secondary source capture with valve for maintenance

Carchique (Community Visit/Pre-Assessment)



Meeting with community members upon arrival



Reservoir for existing system



Sink and cook stove in house

Machigon (Community Visit/Pre-Assessment)



Meeting with water committee



Type of pipe currently used in water system



Tapstand in front of the school



One of the latrines around the community

Pusunchás (Community Visit/Pre-Assessment)



Initial meeting with the community



View of upper Pusunchás from the central part



Flowrate measurement at a source



View of potential source (more than sufficient for entire community)



Upper Pusunchás. Pipeline may need to split to reach upper houses to the right and lower houses to the left (not pictured)



View of central lower part of community 180 degree flip from same vantage point as the first panorama

Saxcha (Community Visit/Pre-Assessment)



Looking out at the community in valley below



Potential Source 1

Initial meeting with community members



Hiking potential pipeline route with community members



Potential source 2

Monte de Armas Bajo (Community Visit/Pre-Assessment)



View of the central part of the community



Initial meeting with the community members



View of lower part of the community



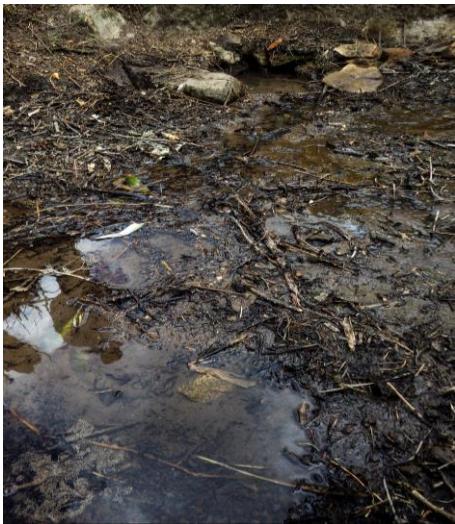
School buildings and soccer field



Sinks and toilets for school building



Taking flowrate measurement at source connected to school



View of the potential source



Pressure break for pipeline to the school



Reservoir for the school



Source for pipeline currently connected to 12 families



Reservoir for existing potable water system lower in community Tapstand connected to the functioning system
El Capuli (Community Visit/Pre-Assessment)



View of central part of the community



One of the household latrines around the community



Self-connected pipeline



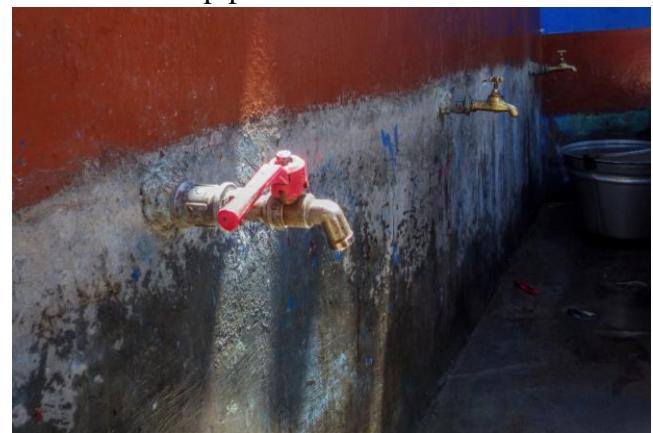
Potential source dug out



Pressure break for pipeline connected to the school



Reservoir tank at the school



Faucets outside the school building



El Capuli Primary School



Latrines at the school

Campo Nuevo (Community Visit/Pre-Assessment)



Campo Nuevo Primary School and Chapel



Household sink connected to the school pipeline

Sinks inside the school complex



Reservoir for the School



Source capture for the school



Household faucet into bucket



Household latrine



Water storage container at one of the more distant houses



Pipeline alongside the main road to the community