IMPLEMENTATION – POST-TRIP REPORT

The Post-Implementation Report is a document written within 8 weeks post-travel to describe the progression of the project from the trip. It is composed of multiple sections detailing our history with the community, the context for the project, the construction process and materials used, and the changes made to the original design. It also evaluates the overall success of the project and and addresses any steps and considerations needed. The post-implementation report includes many additional elements to aid in understanding the project process and design, such as plan-views of the site, photographs, diagrams, drawings, and tables. While our post-implementation report can be more than 40 pages long, this abbreviated version gives an overview of the document and hits the key points.

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1. Project Description

The Project Description section discusses the context and history of our project, as well as some of the community concerns in regards to the issue the project addresses. This section also explains the goals and objectives of our project, as well as the scope of the design and construction. It concludes with a discussion of future steps that should be considered in regards to the project.

Project Context

This section discusses the situation in the community and findings from the 2017 assessment trip that led to the development of the project. Maras experiences a severe water shortage, and one of the areas greatly affected in the community was the local elementary school. The school was only receiving one source of water due to a failure in their other water system. The following is an excerpt from this detailing the issue:

During the assessment trip of 2017, the school staff brought to the team's attention the fact that the northern building does not receive water service. This was because an existing water storage tank, installed on the roof of the building, lost its cap during a storm. Birds contaminated the system with feces. The tank receives water from a pipe attached directly to Maras' distribution system, from the street directly northwest of the school. This is the secondary water supply, not the primary water supply, to the school. The school's primary water supply comes from a connection to Maras' distribution system from the street directly west of the school. The secondary water supply originally provided water service for the kitchen and the bathrooms located within the north building.

The school staff expressed interest to have this tank replaced and the tank and pipe system cleaned so that they could utilize the water that comes from the street northwest of the school, from the distribution system. It was decided that the direct replacement of the Existing Water Storage Tank would involve too many safety hazards for the team to implement and would have limited impact. Therefore, the team intercepted and rerouted this secondary connection in the northwest corner 120 meters over to a new aboveground water storage tank. The team bought the same Rotoplas 1100L tank that is atop the north building to ensure that community members as well as the school staff were familiar with its features and functions in order to easily utilize this water for kitchen use.

Project Goals and Objective

This section discusses the project team's goals and objectives which are expected to be reached after project completion. Some of the objectives the team outlined included setting a concrete base of the Rotoplas tank metal stand, implement the PVC pipe route to connect the water source to the tank, and the disinfection of the implemented 1100 L Rotoplas tank. Below is an excerpt of this section which lists the team's overall goal and one such objective:

The overall goal in the 2018 implementation trip was to provide the school with a secondary water supply and a sanitary way to store this water. Through the use of ½" PVC pipe as well as a 1,100L Rotoplas water storage tank the secondary water supply will become enabled and stored in an antimicrobial basin.

The first objective of construction was to set the concrete base of the Rotoplas tank metal stand. The platform under the proposed Aboveground Water Storage Tank needed to support the weight of the full tank. The weight of the tank is 43 lbs, and with 1100L of water, the Aboveground Water Storage Tank will weigh 2468 lbs. The metal stand is assumed to be 100 lbs. In order to include a factor of safety, the concrete pad was designed to support a weight of 3000 lbs (discussed further in section 2.0) This was decided to be the first objective within construction since concrete needs time to settle and cure/

2. Construction Activities

This section gives a detailed overview of the construction process and provides images of each step. It also discusses any issues that were encountered and changes made to the original plan to mitigate these issues. It concludes with a description and budget for the materials needed, as well as any changes made to the expected number of materials.

Description of Completed Construction Activities

This section describes the construction process step-by step and is illustrated with corresponding images. Below is an excerpt explaining the construction of the foundation for the water tower, along with images of the process.

Upon our arrival at the school, our team set out to complete the foundation for the aboveground water storage tank. This task was performed by Tomas Moffatt, Kelly Napoli, Noah Esham, and Dennis Hornsby (hereby referred to as the "construction team") and a few parents of children at the school, who volunteered to assist. A large 5'9" x 5'9" x 6" square hole was dug into the school's garden area (picture below). Then, in each of the four corners of this square hole, 2' x 2' x 1' holes were dug. All holes were measured with a 4 foot level The construction team and volunteer parents then mixed concrete to be poured into the holes to serve as the foundation for the aboveground water storage tank steel base to be placed on.

The concrete was allowed to set overnight, and then the construction team assembled the steel base for the aboveground water storage tank and placed it atop the concrete *foundation. More concrete was then mixed and poured around the legs of the steel base so that the base would be affixed in place. The Rotopas basin was then placed on top of the steel base and secured in place by the construction team.*

Photo 1: The completed tank and stand structure

The following is an excerpt detailing the pipe installation process:

Work then began on plumbing the secondary water source to the aboveground water storage tank. Using PVC pipe and PVC fittings, the construction team tapped into the secondary water supply and routed piping along the exterior walls of the school to the new aboveground water storage tank. The piping was then connected to the tank, and a faucet and water filter were placed on the outlet of the tank so that it could be used to supply clean water to the school.

Photo 2: Various pictures of the routing of the pipe along the exterior walls of the school (this pipe connects the secondary water supply to the aboveground water storage tank)

Difference between Planned and Actual Construction and Issues Encountered

This section goes over the thought-process for the design alterations made to project and the factors that influenced these decisions. Below is an excerpt from this section:

> *There were a few changes from the planned construction. Upon surveying the site again, the team realized that if the pipe was underground as previously planned, there was a concrete sidewalk that would need to removed and replaced, as well as making the pipe harder to service if any issues arise. The team decided that the pipe could be run along the walls of the school instead. This would avoid busting up the concrete and make the pipe visible for the whole route, making it easier to service. The other change from the initial proposal was the team decided not to run a pipe from the aboveground storage tank to the underground storage tank. This decision was done in order to avoid conflict with the current electric pump already in place within the water tower which takes water from the underground water storage tank to the elevated water storage tank. The team did set up the tank so that it can be easily connected as previously proposed, if the community decides to do so.*
>
> *Many of the school's walls differ in their material composition. This meant that we needed to experiment with different fasteners for attaching the pipe clamps for different walls in the school. Some of the clamps were attached to wooden beams, for these walls we used self drilling wood screws. Other walls of the school were made of a thin layer of plaster*

covering solid concrete. For these walls we decided to use a concrete drill bit to predrill the wall, then insert a concrete nail anchor into the drilled hole, and then use a concrete nail to attach the pipe clamp to the wall.

Materials Used Description

This section describes the materials used and the changes made to the original material list, including quantity. The following is an excerpt that describes the material changes needed to accomodate the piping:

When plumbing the secondary water supply to the new aboveground water storage tank, the quantity of the PVC pipe and couplers changed. Upon arriving at the community, the team decided to modify the original design to run the pipe at an elevated location along the outside of the school building instead of trenching it through the school's courtyard. Because of this additional couplers were necessary to route the pipe around the existing corners of the school building. The quantities of PVC cement and teflon tape were increased as well because of the increase in quantity of PVC couplers, which are held together by either the PVC cement or the teflon tape. The quantity of stainless steel pipe clamps increased because the elevated pipe run along the school building required the attachment of the pipe to the walls of the school buildings, this called for additional stainless steel pipe clamps.

3. Testing Results

This section discusses the procedure for any testing done to materials or the system, as well as the results of the testing. The following is an excerpt describing the system performance testing done:

System Performance Data

It took an hour and 50 minutes to fill up the 1100L tank. The instantaneous flow rate that was acquired was 4/24 L per second or 1/6 L per second. The efficiency and rapid filling of the tank demonstrates that there is very good pressure within the system and will ensure that the school will be able to capture as much water as possible during the limited time of available water. The rest of the system performance was through observation, making sure that there were no leaks or faults throughout the PVC line into the tank. Monthly communication with the principal (Juan Justo) of the school has assured that the system and installed water basin are all working properly. Juan Justo has mentioned that they are using the stored water for cooking/kitchen use.

4. Construction Budget

This section describes the final material quantity and overall cost summary of the project. It also discusses any unexpected costs are variance from the initial estimate. The following is an excerpt evaluating our costs and a table summarizing the project.

The vast majority of cost differences as related to construction materials exists because of differences in quantity of materials purchased. A detailed explanation of the differences in quantities of materials can be found in the section above. The Rotoplas Basin ($257), the concrete mix ($134), the PVC pipe and couplers ($370), and water test ED kit ($145) would be considered "major" construction items purchased. A detailed list of the final costs of all construction items purchased can be seen in the Attachment B. A significant difference between the budget and the actual expenses section lies in the lack of a "Reserved amount for project repairs section." We did not experience any significant damage to any of our project components during the implementation, therefore we did not need to tap into any of the reserved funds.

Primary Trip Activity ::	Implementation			
Lines with an asterisk are automatically calculated.				
	BUDGET *(PRE-TRIP)*	**ACTUAL EXPENSES** *(POST-TRIP)*		
Expenses				
DIRECT COSTS TRAVEL				
Travel + Logistics				
Airfare (7 people at $675 each)	$4,725	$4,178		
Food + Lodging	$125	$125		
Other Travel Expenses (ex: Rental Vehicle, Taxis/Drivers, Exit Fees/Visas, Inoculations/Medical Exams, Insurance)	$795	$795		
In-Country Logistical Support	$1,385	$1,385		
Travel and Logistics Sub-Total*	**$7,030**	**$6,483**		
DIRECT COSTS CONSTRUCTION				
Material			**Expected Quantity**	**Actual Quantity**
Rotoplas Basin and Installation Kit With Tank Stand	$257	$257	1	1
Shipment of Tank to Community	$82	$82	1	1
Wheelbarrow	$10	$10	1	1
Quick Concrete Mix	$134	$134	40 Bags	40 Bags
Concrete Spreader	$9	$18	1	2
Trowel	$11	$22	1	2
Level	$21	$21	1	1
Faucet	$11	$11	1	1
PVC Attachment for Faucet	$1	$0	1	0
PVC Pipe and Couplers	$310	$370	300' of Pipe (15 couplers)	300' of Pipe (30 couplers)
PVC Cememt	$5	$20	1	4
PVC Primer	$9	$9	2	2
Hard Hats	$15	$15	6	6
Teflon Tape (10 yds)	$2	$10	1	5
Ball Valve	$13	$20	5	7
Stainless Steel Pipe Clamps	$10	$50	5	25
Steel Cable and Clamps	$25	$25	2	2
Water Test ED Kit	$145	$145	1	1
Water Analysis Test Kit	$56	$56	1	1
Reserved Amount for Project Repairs	$300	$0	1	0
Material Sub-Total*	**$1,427**	**$1,275**		
Labor				
Local Skilled Labor (Community has agreed to supply at no cost)	$0	$0		
Labor Sub-Total*	**$0**	$0		
Total Construction Costs				
Total Construction Cost	**$1,427**	**$1,275**		
EWB-USA PROJECT FEE (calculated based on trip type)				
Owed by Chapter Sub-Total*	**$1,210**	**$1,210**		
Total Cost of Trip				
Total Trip Cost*	**$9,667**	**$8,968**		

5. Baseline Monitoring Data Collection

Before the onset of the project certain standards and expectations are established to monitor the success of the project. The standards are examined at multiple stages of the project to monitor its progress. Below is some of the baseline questions set and answers to those questions:

Baseline Data Results

The data collected from the baseline monitoring of the implemented project include the following:

- *How long does it take to fill the aboveground storage tank?*
  - *It took one hour and fifty minutes to fill the tank completely. The tank is 1100 Liters in volume.*
- *What is the flow rate of the water coming into the tank?*
  - *The water came into the tank at a rate of ⅙ Liter per second.*
- *Does the float switch work?*
  - *The float switch was observed to operate correctly.*
- *Does the piping system work properly, with no leaks?*
  - *The piping system did not bend, shake,or leak when water was flowing into the tank. Weekly inspections should be made.*
- *Can school staff access the aboveground storage tank easily?*
  - *Yes. The school staff was able to reach the tank easily and use the faucet to collect the water inside.*

Beneficiary Analysis

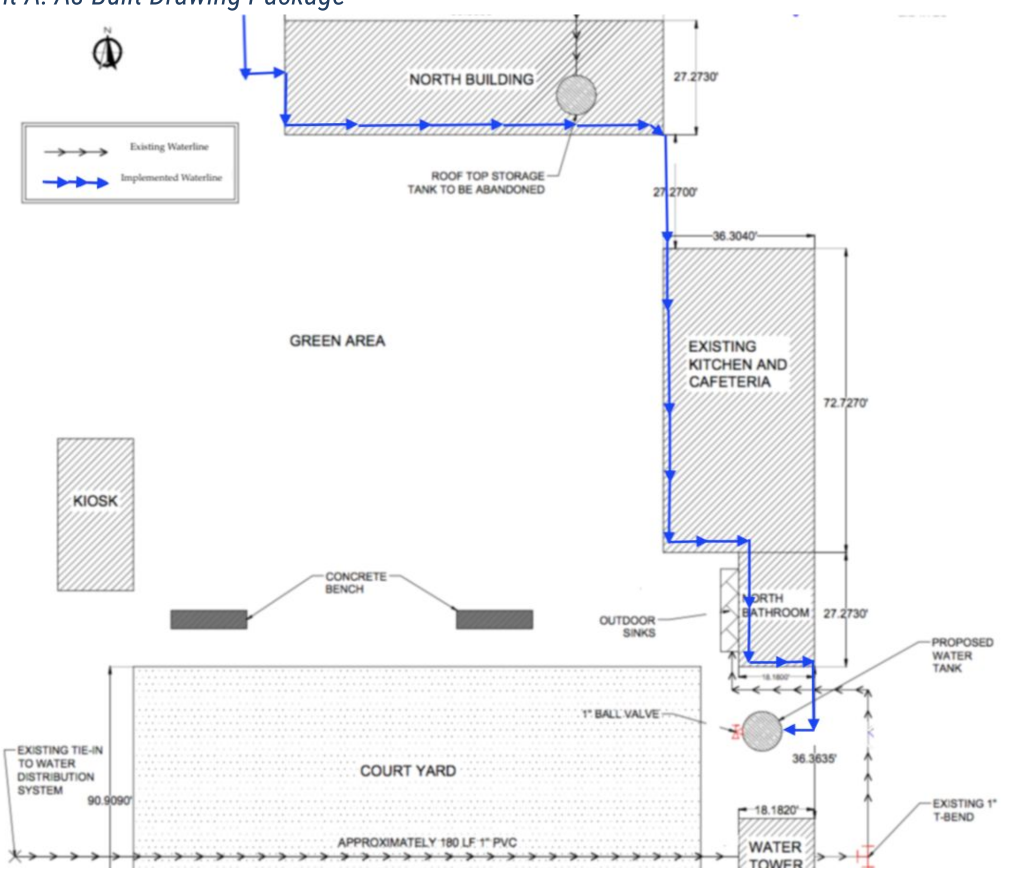
The document concludes with a brief analysis of the potential impact of the project. Below is an excerpt from this section:

The overall project enabled a non-functioning water source to provide an extra 1100L of clean water to the elementary school of Virgen Del Carmen. Considering that the school only receives water for a maximum time of about 1 hour, the enablement of a secondary water supply will relieve the stress of available water. Directly providing clean water to 116 students, the newly installed above-ground water tank will ensure less gastrointestinal illnesses among children. This will increase school attendance as well as decrease the need for probable health care costs.

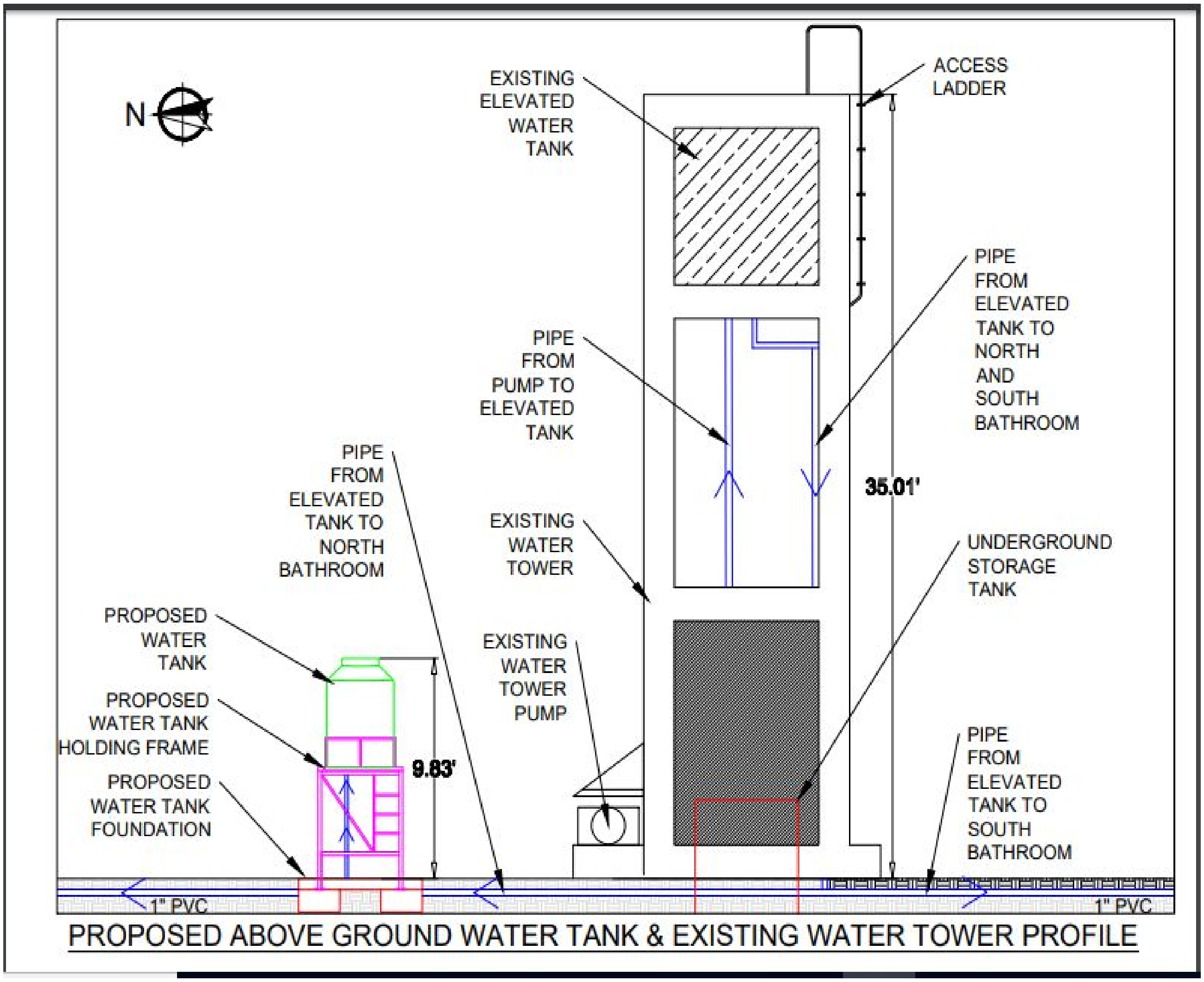
List of Attachments

In this section, we included images, maps, and diagrams that are relevant to our project. This includes plan views and photographs of the project site and construction process. Additionally, there are tables and computer generated drawings providing dimensional information on design of the project components. This section also includes additional documents such as the community partnership document and the operations manual. Below are a few of these attachments.

Attachment A: As-Built Drawing Package



A-1: Above-ground ½" PVC route from secondary water source (NW corner) to the above-ground 1100L water storage tank


N
EXISTING ELEVATED WATER TANK
ACCESS LADDER
PIPE FROM ELEVATED TANK TO NORTH AND SOUTH BATHROOM
PIPE FROM PUMP TO ELEVATED TANK
35.01'
PIPE FROM ELEVATED TANK TO NORTH BATHROOM
EXISTING WATER TOWER
UNDERGROUND STORAGE TANK
PROPOSED WATER TANK
EXISTING WATER TOWER PUMP
PROPOSED WATER TANK HOLDING FRAME
9.83'
PROPOSED WATER TANK FOUNDATION
PIPE FROM ELEVATED TANK TO SOUTH BATHROOM
1" PVC
1" PVC
PROPOSED ABOVE GROUND WATER TANK & EXISTING WATER TOWER PROFILE