Document 522
Post-Assessment Report

Chapter: Worcester Polytechnic Institute
Country: Guatemala
Community: Guachtuq
Project: Rainwater Harvesting

-

Prepared By:
Aaron Pepin
Jessie Ciulla
Katie Picchione
Daniel Singer
Amanda Gatz
Nikos Kalaitzidis

ENGINEERS WITHOUT BORDERS USA
www.ewb-usa.org

Table of Contents

Table of Figures

Post-Assessment Report Part 1 – Administrative Information

1.0 Contact Information

Project Title	Name	Email	Phone	Chapter Name or Organization Name
Project Leads	Aaron Pepin	ajpepin@wpi.edu	(603)689-3869	EWB-USA WPI
President	Thomas Moutinho	tjmoutinho@wpi.edu	(207)831-7011	EWB-USA WPI
Responsible Engineer in Charge	Michael Reiter	michael.reiter@wpi.edu	(860)748-3445	EWB-USA HPC
Traveling Mentor	Rodney Rookey	rodrookey@gmail.com	(860)982-6567	Centurion Waterproofing, Inc.
Additional Mentor	Patricia Austin	pat.austin@state.ma.us	(508)792-7423x204	Worcester DPW
Faculty Advisor (if applicable)	Laureen Elgert	lelgert@wpi.edu	508-831-5452	EWB-USA WPI
Health and Safety Officer	Jessie Ciulla	jmciulla@wpi.edu	(781)987-4139	EWB-USA WPI
Assistant Health and Safety Officer	Nikos Kalaitzidis	nakalaitzidis@wpi.edu	(413)374-1502	EWB-USA WPI
Education Lead	Amanda Gatz	amgatz@wpi.edu	(631)445-8418	EWB-USA WPI
Planning, Monitoring, Evaluation and Learning (PMEL) Lead	Katie Picchione	krpicchione@wpi.edu	(518)727-8024	EWB-USA WPI
NGO/Community Contact	Sucely Ical Lem	cecep@intelnet.gyt	(502)7950-4039	CeCep

2.0 Travel History

Dates of Travel	Assessment or Implementation	Description of Trip
7/20/2010 - 8/03/2010	Assessment	This first trip consisted of meetings with the community members and town officials. Health surveys and water quality samplings were conducted.
7/23/2011 - 08/07/2011	Assessment	Collected more data on water consumption, existing rainwater harvesting practices, and developed a memorandum of understanding with the community

12/31/2012 - 1/10/2013	Implementation	Pilot implementation of rainwater harvesting systems on two homes, assessment of homes for future implementation, and established a monitoring system
5/2/2013 - 5/15/2013	Assessment	Assessment of pilot implementation, health survey and census of community. Also, home assessments for the next 10 homes and set up for next two implementations.
1/2/2014 - 1/14/2014	Implementation	This trip was an implementation trip that was funded by an EPA grant. Therefore there are no official EWB reports. Implemented at 2 homes and re-assessed 8 homes for future implementation. Also, further monitored project success.
5/8/2014 – 5/25/2014	Implementation	Implemented on 8 homes in the community, conducted water quality tests, conducted family interviews and assessed the remaining homes for implementation.
1/3/2015 – 1/11/2015	Assessment	Verified home designs and MOUs with the remaining 24 homes in the community. Visited construction stores to get quotes for the quantity of materials needed for the planned May implementation.

3.0 Travel Team

#	Name	E-mail	Phone	Chapter	Student or Professional
1	Aaron Pepin	ajpepin@wpi.edu	(603)689-3869	EWB-USA WPI	Student
2	Jessie Ciulla	jmciulla@wpi.edu	(781)987-4139	EWB-USA WPI	Student
3	Amanda Gatz	amgatz@wpi.edu	(631)445-8418	EWB-USA WPI	Student
4	Katie Picchione	krpicchinone@wpi.edu	(518)727-8024	EWB-USA WPI	Student
5	Daniel Singer	dtsinger@wpi.edu	(443)974-0814	EWB-USA WPI	Student
6	Nikos Kalaitzidis	nakalaitzidis@wpi.edu	(413)374-1502	EWB-USA WPI	Student
7	Rodney Rookey	rtr911rs@yahoo.com	(860)993-6233	EWB-USA WPI	Professional
8	Patricia Stapleton	pastapleton@wpi.edu	(732)757-1081	EWB-USA WPI	Professional

4.0 Health and Safety

4.1 Incident Reports

There are no incident reports to be filed for this past trip.

Did any health or safety incidents occur during this trip? ___Yes _X_No

5.0 Planning, Monitoring, Evaluation and Learning

5.1 Canceled/Non-functioning Projects
Has the status of any of this program's past-implemented projects changed to Canceled or Non-functioning? ___Yes __X_No

5.2 If this was the first assessment trip for the program, is the 901 – Program Plan and Baseline Study included with this report?
___Yes ___No _X_Not the First Assessment trip

5.3 If this was not the first assessment trip for the program, is the 901B – Program Impact Monitoring Report included with this report?
_X_Yes ___No

5.4 Is the signed 902 - Project Partnership Agreement included as an appendix to this report? ___Yes _X_No

6.0 Budget

6.1 Project Budget

Trip type: A= Assessment		
Trip Expense Category	**Estimated Expenses**	**Actual Expenses**
Direct Costs		
Travel		
Airfare	7200	5120
Gas		122
Rental Vehicle		
Taxis/Drivers	1000	776
Misc.		275
Travel Sub-Total	$8,200	$6,293
Travel Logistics		
Exit Fees/ Visas	0	0
Inoculations	0	0

Insurance	240	320
Licenses & Fees	180	0
Medical Exams	115	0
Passport Issuance	0	0
Misc.	0	0
Travel Logistics Sub-Total	$535	$535
Food & Lodging		
Lodging	1400	853
Food & Beverage (Non-alcoholic)	100	200
Misc.	350	0
Food & Lodging Sub-Total	$1,850	$1,053
Labor		
In-Country logistical support	0	0
Local Skilled labor	1200	632
Misc.	0	0
Labor Sub-Total	$1,200	$632
EWB-USA		
Program QA/QC **(1)** See below	$1,500	$1,500
EWB-USA Sub-Total	$1,500	$1,500
Project Materials & Equipment *(Major Category Summary)* add rows if needed		
Printing	200	15
Project Materials & Equipment Sub-Total	$200	$200
Misc. *(Major Category Summary)*		
Report Preparation		
Advertising & Marketing		
Postage & Delivery		
Misc. Other		238
Misc. Sub-Total	$0	$238
TOTAL	$13,485	$10,451
(1) Program QA/QC (EWB-USA Headquarters Project Managers and Chapter Relations Managers) Assessment = $1,500 Implementation = $3,700 Monitoring = $1,150		

EWB-USA Headquarters use:		
Indirect Costs		
EWB-USA		
Program Infrastructure **(2)** See Below	$500	$500
Sub-Total	$500	$500
TRIP GRAND TOTAL (Does not include Non-Budget Items)	$13,985	$10,951
(2) Program Infrastructure (EWB-USA Headquarters accounting, administration and fundraising) Assessment = $500 Implementation = $1,200 Monitoring = $350		
Non-Budget Items:		
Additional Contributions to Project Costs		
Community		
Labor	100	100
Materials	0	0
Logistics	200	200
Cash	400	400
Other	0	0
Community Sub-Total	$700	$700
EWB-USA Professional Service In-Kind		
Professional Service Hours	216	216
Hours converted to $ *(1 hour = $100)*	$21,600	$21,600
Professional Service In-Kind Sub-Total	$21,600	$21,600
TRIP GRAND TOTAL (Includes Non-Budget Items)	$36,785	$36,785
Chapter Revenue		
Funds Raised for Project by Source	**Actual Raised to Date**	**Actual Raised**
Source and Amount *(Expand as Needed)*		
Engineering Societies		
Corporations		1000
University		2000
Grants - Government		
Grants - Foundation/Trusts		1000

Grants - EWB-USA program		
Other Nonprofits		500
Individuals		4645
Special Events		
Misc.		1200
EWB-USA Program QA/QC Subsidy **(3)** See below		500
Total	$0	$10,845
Remaining Funds Needed	**$**	**$**

6.2 Professional Mentor Team Hours

Name(s) of Professional Mentor(s)	Pre-trip hours	During trip hours	Post-trip hours	Total Hours
1. Patricia Stapleton	10	90	2	102
2. Rodney Rookey	12	90	2	104

7.0 Project Discipline(s): Check the specific project discipline(s) addressed in this report. Check all that apply.

Water Supply
____ Source Development
_X__ Water Storage
_X__ Water Distribution
____ Water Treatment
____ Water Pump

Sanitation
____ Latrine
____ Gray Water System
____ Black Water System

Structures
____ Bridge
____ Building

Civil Works
____ Roads
____ Drainage
____ Dams

Energy
____ Fuel
____ Electricity

Agriculture
____ Irrigation Pump
____ Irrigation Line
____ Water Storage
____ Soil Improvement
____ Fish Farm
____ Crop Processing Equipment

Information Systems
____ Computer Service

8.0 Project Location

Latitude: -90.494921 W
Longitude: 15.372468 N

9.0 Project Snapshot for Publicity

9.1 Problem identification

The problem identified by the community of Guachtuq is a general lack of water security faced by the thirty-five families.

9.2 Project goal

The goal of this project is to ensure each family in Guachtuq has adequate quantity, quality, and access to water. This is achieved through the implementation of individualized rainwater harvesting systems at each home. Additionally, it is crucial to effectively transfer construction and maintenance knowledge in order to ensure long term project success.

9.3 Project status

On this trip, the travelers verified home designs at each of the remaining 24 homes in the community. Each home was visited and the conditions outlined in the MOUs were confirmed with each of the families. The team also worked with the club's NGO to confirm plans for logistics of moving the materials to the community and community manpower for building in May 2015. The next steps for this project will be to verify the material lists based on the updated system designs and prepare for the implementations.

Post Assessment Report Part 2 – Technical Information

1.0 Executive Summary

This is the post trip report for the January 2015 Assessment trip taken by the Worcester Polytechnic Institute Engineers Without Borders USA club for the #6871, Rainwater Harvesting project in Guachtuq, Guatemala. The purpose of the trip was to re-assess the remaining homes in the community and make preparations for the planned final implementation in May 2015.

The goal of this project is to achieve water security for each of the families in Guachtuq, Guatemala. This goal is being accomplished through the implementation of individualized rainwater harvesting systems; thus, the scope of this project encompasses the 35 families living in the community as of May 2014. Each home receives its own individual system due to the lack of a central community location. Systems are designed with enough storage capacity to ensure families will have adequate amounts of water to meet cooking and drinking needs year round.

Guachtuq, a rural community of about 220 people, is located in the Alta Verapaz region of Guatemala, a mountainous region in the center of the country. Many community members exclusively speak Pokomchi, an indigenous Mayan language, although some are also able to speak Spanish. As has been established through assessment trips, the community has identified lack of water security as their most pressing problem. During the implementation of the rainwater harvesting systems, EWB-USA WPI emphasizes the relevance of the entire system, and not just an additional tanks for the community. Each family is individually assessed, and the number of tanks in a system is based on that assessment. The 35 families are dispersed over about a 1 km road that leads up a mountain just outside of the San Cristobal municipality. The chapter's in-country contact NGO is CeCEP (El Centro Comunitario Educativo Pokomchi), which aids the travel teams with cultural information, translators, a work space, and communication with the community when the team is not in Guatemala.

EWB-USA WPI began the partnership with Guachtuq in 2009 when the community first presented its main concerns to EWB-USA. From the first two assessment trips, it was established that bringing water security to the community in Guachtuq should be the focus of the project. During the dry season, the community relies on a single communal water source located approximately 1 km downhill from the top of the community. This distance, in combination with the mountain's steep slope, makes accessing water a long and difficult task for many of the community members. Some homes have existing rainwater harvesting systems, however, they do not always meet the water needs of the families. This problem mainly manifests itself in that they are often not built as closed systems, leading to insect infestations in the tanks and contamination of the water. Following the success of the first two assessment trips, EWB-USA WPI traveled on its first implementation trip in January of 2013 and implemented 2 pilot individualized

rainwater harvesting systems. This trip was followed up with another assessment trip in May 2013 to ensure the functionality of the pilot systems. The team received positive feedback regarding the first two systems and returned in January 2014 to gather information and to implement an additional 2 systems. The team also made some system improvements, including the first flush system. With 4 successful systems implemented, EWB-USA WPI returned in May 2014 to construct systems with 8 more families. On the trip in May 2014, community families were heavily involved in the implementation, showing their complete commitment to the project. Finally, on this past assessment trip, the team confirmed system designs, materials quantities, and community involvement for the planned implementation in May 2015.

On this past trip, there were a variety of tasks accomplished. The first of which was completing extensive monitoring on all of the systems that EWB-USA WPI had implemented in the community. The travelers went to each home and visually inspected every system, as well as had a conversation with each of the families about their system and its functionality. Each of the remaining homes without a system were also reassessed in order to confirm suggested designs brought down by the team, and reaffirm preparations that had been written in the MOUs during the May 2014 trip. There were also an abundance of water quality tests completed in the community, on EWB-USA WPI systems, previously implemented systems, and the finca at the bottom of the community. The team also took a day on the trip to visit larger materials stores in the neighboring municipalities Coban and Santa Cruz. The team is receiving quotes from 3 different stores regarding the needed materials for the planned May 2015 implementation.

From all of these tasks, the team was able to collect valuable information regarding the project and the homes remaining to be implemented on in the community. From the monitoring, the travelers were able to confirm that the families in the community who had received systems were doing an exemplary job maintaining them. Each of the families had been maintaining the first flush, had cleaned their tanks at least once since May, and had been cleaning out their gutters as well. When reassessing the homes to be implemented on, designs were confirmed with each of the families so that a complete and accurate materials list could be compiled before the visits to the construction stores. The water quality tests that were taken on the existing systems in the community confirmed that the systems were functioning properly, and even that the first flushes were preventing E Coli and bacteria from entering the tanks. Using all of this data, the club feels that it is adequately prepared for the planned 24 home implementation in May 2014.

Moving forward from this trip, EWB-USA WPI plans on submitting the 525 pre-trip report for an implementation trip in May 2015 to implement systems on the remaining 24 homes in the community and complete the implementation phase of this project.

2.0 Program Background

The Engineers Without Borders-USA chapter at Worcester Polytechnic Institute (EWB-USA WPI) aims to provide the community of Guachtuq, Guatemala with water security. The community of Guachtuq is located in the Alta Verapaz region of Guatemala and is home to about 220 Pokomchi (people of Mayan descent) among 37 families. Of the many problems they face daily, a lack of water security was identified as their greatest concern. Water security can be described as having adequate quantity, quality, and access to water to meet a home's basic needs. Currently, many families rely on a water source called the *finca,* a polluted, spring-fed water basin located a half-hour walk downhill from most families in the community. During the dry season, which lasts from February to May, the finca often dries up, forcing families to find other, more distant sources of water.

EWB-USA WPI completed two assessment trips in 2010 and 2011, where the team started to form a relationship with the community members of Guachtuq. The team conducted in-house assessments, held community meetings, and undertook water quality studies. In 2011, the team conducted a community wide survey to determine a water consumption rate for each family. Unfortunately, no trends emerged that related the number of family members to water consumption across the community, so the team has since followed WHO standards for determining water consumption rates. The team also thoroughly assessed the two homes chosen by the community for pilot implementation. This included measurements of each home as well as in-depth discussions of the needs of each family.

Throughout the project, one of the most important tools that the team has developed is an Excel model to assist the team when creating the metrics for each system. Using a variety of parameters, the model helps the team design systems to fit the specific needs of each family. Considering average regional daily rainfall, roof area of a home, number of family members, and water consumption rate, this model can be used to determine how many additional tanks each family needs to ensure sufficient water for drinking and cooking throughout the dry season.

Using information gathered from the first two assessment trips, Excel model results, and nearly two years of research and design, the team constructed two pilot systems during the first implementation trip in January 2013. The goal of the pilot project was to ensure that the Excel model worked properly and to provide a basis for future system design. Other benefits of a small-scale implementation included developing methods for construction and beginning to establish a knowledge base about constructing rainwater harvesting systems within the community. In order to accurately determine if these pilot systems served the families appropriately, a monitoring system was also established during this implementation trip. A volunteer at CeCEP (El Centro Comunitario Educativo Pokomchi), EWB-USA WPI's partner NGO, visited the community while the team was out of the country, collected preliminary information on the efficacy of the rainwater harvesting systems, and received verbal feedback from both families.

The team completed a third assessment trip in May 2013. The goal of this trip was to evaluate the success of the pilot systems and assess homes for the second implementation. In addition, a thorough census was conducted to gather demographic information about every family and to learn general information about the community. Water quality tests were also collected at various water sources throughout the community. The monitoring system established during the January 2013 trip evolved into a bi-weekly survey that asked residents about their water consumption habits. Follow-ups were conducted with the two pilot homes to ensure the systems functioned properly and, most importantly, satisfied each family's daily needs.

The second implementation trip, EWB-USA WPI's fifth trip to Guachtuq, took place in January, 2014. Though not an official EWB trip since it was funded by a grant through the EPA P3 program, this trip was essential to the progress of the project. The team constructed two rainwater harvesting systems, conducted water quality tests, held in-depth, semi-structured interviews, established a connection with the mayor of the Municipality of San Cristobal, developed stronger relationships with CeCEP and community members, and further assessed the eight homes scheduled to receive systems during the May 2014 implementation trip. Necessary details were also discussed with local hardware stores, water tank vendors, and the Municipality to arrange availability of materials and plan for transportation.

EWB-USA WPI's sixth trip to Guachtuq, the third implementation trip, took place in May 2014. In under ten days, the team and community members built eight rainwater harvesting systems, updated systems of previous beneficiaries, conducted two rounds of water quality testing, interviewed almost every family in the community, met with the mayor of the Municipality, held multiple community meetings, strengthened relationships with local NGO partner CeCEP, and assessed the homes of the remaining families.

In January 2015, the club had an additional assessment trip in order to prepare the community for the upcoming 21 home implementation in May 2015. This was done by confirming the home designs with each family in order to be sure the compiled materials list is accurate. The preparations in each family's MOU were also confirmed in order to be sure that each home and EWB-USA WPI were on the same page with what the family was receiving and what they needed to have completed before the travelers arrived in May 2015. The team also worked with CeCEP to locate and retrieve quotes for materials from various local construction stores for the quantity of materials needed for the remaining 24 systems. They also talked with the Municipality of San Cristóbal about the transportation of materials from the stores to the community.

Furthermore, the team strengthened ties with the community to ensure success in the May 2015 implementation. Additional time spent with children in learning sessions resulted in an immense transfer of knowledge such that nearly the entire community has a basic understanding of the construction of these systems. The next step for EWB-USA WPI and the community of Guachtuq is to complete implementation of the remaining 24 rainwater harvesting systems in May 2015.

3.0 Project Description

The project in Guachtuq is focused on providing individual rainwater harvesting systems to each home in the community. A map of the community is attached below in this section. The project is focused on being a system project and not just a tank implementation. This is in contrast to other rainwater harvesting projects that the community has had experience with in the past. Using the Excel model described in the project background we can determine the number of tanks each home needs or if the home does not need any new tanks installed at all. In a case like this, we would just be adding system improvements, such as ensuring that it is a completely closed system so that no insects can infiltrate it. The basic components of the rainwater harvesting systems that we are implementing include the roof of the home, gutters, piping, a first flush, tanks and then a concrete base for the tanks. The gutters are attached to the side of the house using gutter clips made in the community from boards of wood and installed at an angle that makes sure that there won't be any stagnant water stuck in them. The PVC piping coming out of the gutters then leads to a first flush in order to take off the first volume of water coming off the roof, effectively rinsing the roof. The rest of the clean water then flows into the 2500L HDPE Rotoplas tank(s). These tank(s) rest on top of a constructed base, which is a thin poured slab of concrete with cinderblocks placed on top to elevate the tanks to a height that makes the tap coming off the tanks accessible.

4.0 Trip Description

On this past assessment trip the team ensured that the community of Guachtuq was prepared for the upcoming planned implementation trip in May 2015. During the trip, the team confirmed that all of the families that would be receiving systems were fully prepared for the time commitment and were informed of all preparations they must complete prior to the implementation in May 2015.

It was important on this trip to verify that the knowledge needed to construct these rainwater harvesting systems had been properly transferred to the community members. The successful relocation of a family's system to a new location by members of the community without any assistance from EWB-USA WPI proved that the community members are in fact knowledgeable concerning the construction of these systems. In addition, the team conducted monitoring meetings with each of the families in the community who had previously received EWB-USA WPI rainwater harvesting systems to assess how the systems were functioning. This monitoring information is discussed in more detail in section 5.3 and the data that was collected is included in Appendix A.

The team also held an education session with two groups of the children of the community to reinforce safe and effective use and maintenance of the rainwater collection systems. These learning sessions included discussion on cleaning and

maintaining the system, as well as general water security discussion and how water relates to their health. As discussed later in section 7.0, it was found that the travelers were able to gain a great amount of information from the children as well as imparting knowledge to them. The lesson plans for these can be found in Appendix B.

The team also held two community meetings while in Guachtuq. In addition to the normal reiteration of preparations and general announcements regarding the itinerary of the trip, these meetings laid the groundwork for the creation of construction teams for the May 2015 trip. Each family being implemented on was informed that they were required to have one family member participate in the construction of the systems over the course of the May 2015 trip. In addition one family member from the eight homes that were implemented on last May are also required to participate in the construction in order to facilitate proper knowledge transfer within the community. With at least one member from these thirty-two homes, it is expected that the community members will be able to split up into five independent construction teams. These teams will be organized based on input from the water committee in the community and CeCEP, which will ensure that the experienced community members are evenly distributed among the teams. Finally, new beneficiary families were told that they would be required to attend a meeting with CeCEP in March before their implementation to verify final details about their system designs. The club is confident the teams will be able to successfully complete all twenty-four homes in May 2015.

This assessment trip enabled the club to ensure that all parties involved, including the community, CeCEP, EWB-USA WPI, and the new possible construction stores located in Santa Cruz and Coban, are willing and prepared to complete the expected final implementation at the remaining twenty-four homes in the community this coming May 2015.

The itinerary for this trip is attached in Appendix C.

5.0 Data Collection and Analysis

5.1 Water Quality Tests

The quality of the water that enters and exits the rainwater catchment systems is monitored closely by EWB-USA WPI. During the January assessment, the team tested the water of ten systems in the community along with water from the finca using Colilert's *E. coli* Portable Microbiology Laboratory (PML) test kit. Testing was done in triplicate and with two forms of tests; qualitative test tube and quantitative petrifilm samplers. From the data in Appendix D, it can be seen that the implementation of the first flush has had a positive impact on the quality of the water entering the tanks. Samples 22 and 46 (first flushes leading into EWB tanks) fluoresced, signifying the presence of *E. coli* at those locations, and sample 54 (first flush leading into government tank) had one blue petrifilm colony,

signifying *E. coli* presence. There is no *E. coli* presence in samples from tanks to which these first flushes feed. Some other samples to note are House 30's concrete tank (samples 28-30), the finca (samples 40-42) and Jose's Government Tank (sample 73), all of which fluoresced, while samples 28, 40 and 41 each showed one blue petrifilm colony.

Some considerations the team took into account are the fact that it had just rained prior to sampling. This meant the first flushes would have been recently filled. Factors such as the schedule in which the beneficiaries clean the tanks allows for a certain amount of human error. The concrete tanks are typically left uncovered due to the fact that the covers are heavy and the women and children cannot replace them when the husbands are away at work, which could lead to higher bacteria or E Coli counts.

5.2 Quotes from Stores

Quotes were collected from 3 different construction stores, one in Santa Cruz, a municipality about 15 minutes outside of San Cristobal, and two in Coban, about a half hour outside of San Cristobal. These are attached below in Appendix E. These quotes are being used to accurately create a budget for the systems designed to be implemented in the May 2015 Implementation trip. The quantities in these quotes were estimates that were created in country. An accurate materials and prices list will be included with the 525.

5.3 Report from Evaluations

Upon returning to Guachtuq, it was crucial for the travel team to monitor the twelve homes that had already received tanks. Most importantly were the eight homes that received systems in May 2014 and one of the homes that received a system in January 2014 but had to relocate, thus entirely rebuilding their system independently of EWB-USA WPI assistance. The monitoring was conducted in groups, with one section of the travel team asking system maintenance questions (seen in Appendix A) and confirming census data. During this time, the second monitoring group visually inspected all aspects of the system, noting anything especially clean or dirty, or parts of the system that had broken. In the data presented here, dirty is defined as having a thin layer of settled dirt in the bottom of the tank. After these groups monitored all twelve homes, the team regrouped at CeCEP to compare and contrast the results from the interviews with the visual observations to identify any overarching system issues and to address any discrepancies that may have arisen due to language barriers or unclear translation. Below are the results from monitoring.

House Number	Gutters	Tank(s)	First Flush	Filter	Census	Additional Comments
House 1	Clean	First EWB tank dirty; second EWB tank cleaner	Clean; full; needs to be glued	Clean; Slight smell of chlorine; torn	No change	Used finca once for washing clothes; want to separate tanks
House 5	Clean	First EWB tank dirty; second EWB tank cleaner	Empty	Clean; Slight smell of chlorine	No change	Water having capillary effect on roof because of slight pitch (will be addressed); only used finca once;
House 8	Clean	Clean	Clean; full	Non existent		Tanks washed by father; use tanks for all needs; first flush for washing clothes
House 9	Clean	EWB tanks: dirty, settled dirt; Gov't tanks: appeared clean	Clean; full	Unused; causing slow flowrate(manufacturing issue)	No change	Gov't Tanks almost empty, fixed overflow pipe in EWB tank system; do not go to finca
House 16	Clean	Clean	Clean; full; being used appropriately	Clean; Slight smell of chlorine	No change	Noted that when they clean tanks don't have enough water; use tanks for everything; do not use first flush
House	Clean	Clean	Clean; full;	Very dirty,	No	Using some

18			being used appropriately	smells	change	of son's roof to fill tank; use first flush for showering; replaced mosquito netting as needed; clean tank with chlorine
House 21	Clean	Both tanks have some settled dirt at the bottom	Clean; full; being used appropriately	Clean; Slight smell of chlorine	No change	Use tank for everything; first flush for bathing
House 26	Clean	Clean; one tank needs cap for small hole	Not functional, will be fixed	Dirty	Eldest daughter has a new baby	Overflow needs additional mosquito netting; faucet needs reparation; gov't tank unused until faucet fixed; do not go to filter
House 27	Clean	One EWB tank has dirt accumulation, other EWB tank is cleaner	Clean; full; being used appropriately	Dirty and Slimy		Need to drill a hole in elbow of overflow, currently acting as a siphon; first flush used to bathe; put overflow in other containers; gutter union drips
House 28	Clean; potential stagnant water	Clean; needs small patch;	Clean; full; being used appropriately; use to bathe	Clean; odorless	No change	Use finca to wash clothes; kids clean tank with chlorine,

	source at end, will be cut					brush and soap
House 29	Clean	Clean; gov't tank needs to be fixed	Clean; full; being used appropriately	Dirty and slimy	No change	No longer use finca
House 31	Clean	Clean; being used for all water needs	Clean; full; being used appropriately	Clean; smelled like chlorine	No change	Tank gets used up quickly when it isn't raining; reiterated that it is for potable water only

Overall, EWB-USA WPI was pleased with the results of monitoring previously implemented homes. In addition to the fact that all systems are still functioning, the level at which they were being maintained indicates that the families understand the importance of system maintenance. EWB-USA WPI believes that the educational lessons that were part of the May 2014 implementations played an integral role in the success of maintenance.

There are some trends that indicate significant adherence to guidelines that EWB-USA WPI discussed with the beneficiaries after system construction. One is that almost all families indicated that the only changes they made to their system were removing the gutters from the roofs so that they could clean them. Upon our inspection, all gutters were oriented and functioning correctly, showing that the community members have no issue with that aspect of system maintenance. Additionally, every family described that they emptied the first flush after every rainfall and used the water for something other than eating or drinking. This is exactly what EWB-USA WPI recommended, and is a good sign that the community members understand ideas revolving around water sanitation and how to promote it. Families that cleaned their filters did so appropriately, and those that did not appeared to have forgotten to clean them but were amicable to the idea of cleaning them in the future. Every family indicated that they had cleaned their tanks at least once since May, and when asked, all described appropriate cleaning methods.

As expected, there are some areas which need improvement. Specifically, repeating problems were that the mosquito netting often had tears, some PVC fittings were unglued, and some gutter unions dripped. In addition, multiple filters needed to be washed more frequently. While amendable, these issues drew light to some areas where knowledge transfer was not as strong as it could have been. EWB-USA WPI will

improve upon this during the May implementation trip by increasing education manuals for filter maintenance and reiterating what can be glued in the system.

6.0 Photo Documentation

Figure 1: This is a photo of the first community meeting during which the team took time to explain why the EWB-USA WPI team was there, the expected itinerary for the week, and the expected preparations for all the remaining families who would be receiving systems.

Figure 2: This is a photo of Ana Yuja, who lives at one of the homes that got an EWB-USA WPI system in May 2014. She has found employment sorting cardamom seeds in her free time now that she no longer needs to collect water from the finca because of the system.

Figure 3: This picture is of a team of travelers assessing House 24, one of the homes that will be implemented on this coming May 2015. Travelers in this photo are Amanda Gatz and Katie Picchione.

Figure 4: This is a picture of House 12, one of the homes that will be implemented on in the coming May 2015 trip. At this home the concrete tank was also assessed for possible improvements to be implemented in the coming trip.

Figure 5: This is a picture taken at one of the two learning sessions that the team conducted in the community.

Figure 6: This was a picture taken after the second community meeting with the entire community and the travel team.

7.0 Lessons Learned

There were many lessons learned on this trip, both pertaining to the logistics of a trip to this community, and to the construction and maintenance of the systems. A list of important lessons that the team learned on this past trip follows:

Don't underestimate how much the community is capable of: This was shown through the reconstruction of a system that was on a house that moved within the community. They were able to deconstruct, move, and then reconstruct the system without the knowledge or support of EWB-USA WPI. The team inspected the system while in country, and it proved to be put together properly and thoroughly thanks to the knowledge transfer facilitated by previous travel teams. In addition, in learning sessions that took place with the children, many of them had unexpected knowledge an understanding of water issues, and awareness of what may be causing health issues from the water.

Work with the community's normal schedule: In Guachtuq, they start their days much earlier than the travel team is normally used to. In past trips, travel teams have resisted this change, but on this trip, it was chosen instead to embrace it. As a result, there was more productive time gained in the community. It was easier to get the communities assistance, and also easier to set up meetings when all were available at more similar times. It is also a gesture of respect, showing the team respects their time as much as they work to respect the teams.

Be sure to have the right translator for the job: When the team reached the point where some harder decisions were being made concerning individual systems for families, it was found that the age of the translator made a large difference. While in country, we work with different translators who work at CeCEP, one of whom is college aged, the other two who are adults. When it comes to breaking hard news, or reinforcing a message that a family may not want to hear, it proved beneficial to have a more respected adult around. Societally, age makes a large difference in Guachtuq when it comes to respect and the amount that someone may feel they can argue a decision.

Be sure to be sensitive to holidays or religious days: This trip itinerary had the team conducting a community meeting on a Sunday. This was something that the team was concerned about from the beginning, but had checked in with CeCEP to be sure it would be acceptable. After many assurances the team chose to go ahead with it. In this case, it proved to not be an issue, but it is still an important consideration to keep in mind moving forward within this project, or in the scope of a new project.

8.0 Project Status

Moving forward, the status of this project would fall under the *Design* category. Since this assessment trip does fall in the middle of our implementation phase, it does have a unique meaning for the preparation needed before the upcoming implementation trip. The design referred to here is designing the logistics and specifically the materials transport for the planned 24 home implementation this coming May 2015. The technical design for the rainwater harvesting systems being constructed is not changing. Each system will still be designed in a similar fashion, with the number of tanks reflecting the needs of each individual family. All the information needed for designing the logistics to have a successful implementation trip this coming May was gathered on this trip, and is attached in the appendices below. Specifics for the May 2015 implementation trip will be described in more detail in the 525 pre-trip report submitted for the upcoming February 15th submission cycle.

9.0 Project Monitoring

9.1 Project Status Table

Project Type	**Project Discipline**	**Date of Completion** (mm/dd/yy)	**Functionality** (enter one range per project)			**Periodic Maintenance** (yes or no)	**Community Capacity** (yes or no)
			0-50%	50-75%	75-100%		
Water Supply	Rainwater Harvesting	Ongoing			75-100%	Yes	Yes

9.2 Project Functionality Indicators

Project Type	**Project Functionality Indicator** (select from Document 906)	**Monitoring Result**
Water Supply	Number (or percentage) of community members satisfied with the project	Through the monitoring interviews described in section 5.3, it was found that all the community members who had received an EWB-USA WPI system were very pleased with its functionality. The only negative feedback received involved the Rotoplas filters that come with the tanks, and from an overflow that was broken on one of the original pilot systems.
	Quantity of water available to each household during dry and wet seasons	After talking with each family, it was found that nobody had needed to use water from any other source besides their EWB-USA WPI system for drinking or cooking water since the May implementation. In addition, some families were able to fufill all their water needs from their EWB-USA WPI system. This shows the system functionality through the wet season to be even better than anticipated. This result was also achieved by the community properly

		utilizing the water from their first flush as described in section 5.3.
	Quality of the water at the water point	As described in section 5.1, extensive water quality tests were completed on the previously implemented EWB-USA WPI systems as part of ongoing monitoring on this past trip. As is described above in further detail, the tests showed the EWB-USA WPI systems to be the cleanest source of water available to the families. The first flush was properly collecting bacteria and E Coli, preventing it from getting into the tank and drinking water.

9.3 Periodic Maintenance Indicators

Project Type	**Periodic Maintenance Indicator** (select from Document 906)	**Monitoring Result**
Water Supply	Level of cleanliness of gutters feeding a rainwater harvesting system	It was observed by the travelers on this trip that all of the gutters were remarkably clean and free of any debris. When asked, each of the homes with an EWB-USA WPI system reported that they had pulled the gutters down off their house at least once since the May 2014 trip in order to clean them out with chlorine.
	Level of cleanliness of water storage tanks	It was observed by the travelers and confirmed through interviews with past beneficiaries that the tanks had been cleaned at least once since the May 2014 trip. This shows that the community understands the value of the closed system and the importance

		of keeping the system clean.
	Observed evidence of routine maintenance on the system done accurately without EWB-USA WPI	When the travelers first arrived and interviewed House 8, the house of Cristobal Cojoc, the team observed his system taken apart for cleaning. When the team returned later in the week, the system was reassembled properly with all parts of the EWB-USA WPI system intact. In addition, one family had to move their house and completely rebuilt their system properly at their new home.

9.4 Community Capacity Indicators

Project Type	**Community Capacity Indicator** (select from Document 906)	**Monitoring Result**
Water Supply	Community completed major repairs to the system accurately without EWB-USA WPI	House 27, the home of Cristobal Coy Max, was moved to a different location in the community while the EWB-USA WPI team was not in country. During this time, the community members moved the system along with the house and reconstructed it in perfect working order at the new home without the knowledge or assistance of EWB-USA WPI. The travelers inspected the system when they went down and found the only part missing was a small hole to be drilled in the overflow to keep it from becoming a siphon when the tank fills up.
	Chapter observed community members training others	Just before the travel team arrived, one community member from house 26, Roberto, went around to each

		home that had a system to be sure everything was functioning properly. He realized that the mosquito netting in the gutters of each home was broken, and therefore brought extra mosquito netting that the team had left in country, to each home and demonstrated to them the proper method of replacing it. This was done in concert with our in country contact Alvaro, a volunteer at CeCEP.
	Existence of broken components	Besides the mosquito netting being broken, there was also one home with filters that were not allowing proper water flow coming out of the system. The family worked to figure out the problem on their own, and when they were not able to, consulted other community members including Roberto and our in country contact Alvaro. Upon inspection by the travelers, the team could not figure out what was broken, but was able to get the filter functional again. The club is looking into this before the May trip and will have a solution prepared for the family by then. This problem solving shows the amount the community cares about having a proper system and the knowledge that the community has was showcased by the way that they were consulted instead of going straight to asking the club.

9.5 Additional Information

There was a lot of information gathered on this assessment trip, and many of the situations mentioned in the Additional Information section of the previously submitted 526 post trip report were resolved.

The family at House 27, the family of Cristobal Coy Max and Herlinda Ixian had to move their house within the community in the time between the previous May implementation trip and this assessment trip. When they moved their house, they worked with other members of the community to move their system as well. This was all done without the knowledge of EWB-USA WPI. After the reconstruction was recompleted, Alvaro, the club's in-country contact saw that it was completed and took pictures to send back to the club. When this January's travelers arrived in country, they made sure to confirm that the system was properly reconstructed. Upon inspection, we found that the system was assembled perfectly, with the sole exception of needing a small hole in the top elbow of the overflow in order to prevent the overflow from siphoning all the water out of the tank after it started emptying. This was great news for the team, and for the project. Through personal excitement, it also showed that the club had properly transferred knowledge on how to construct and maintain the systems. This is important because through this EWB-USA WPI was able to confirm the general sustainability of the project before the implementation phase was even finished.

In addition, the complications with contracts that were present at the end of the last trip were all resolved. At house 34, the house of Maria Magdalena, it was decided that the system would be implemented at the house that she was building next door to the originally assessed store that she was living in. This was because EWB-USA WPI had made it clear to the community that they were not implementing on stores or businesses, only personal homes/residences. This solution was run by both representatives at CeCEP and members of the community, and was received well by both parties, so the club does not expect any social complications due to the change in plan.

The other conflict resolved from the May 2014 trip involved signing an MOU with house 22, the home of Teresa Yuja, so in the planned May 2015 implementation, she will be receiving a 3 tank system as has been shown to be necessary by the club's Excel model.

New issues that did come up on this trip were that two families, Houses 19 and 42, choose not to receive a system from EWB-USA WPI due to social and economic issues outside of the families control. One house, House 15 is still debating whether they are going to choose to participate in the project or not, and will be having a conversation with representatives from CeCEP in the near future to confirm this information for the club.

10.0 Professional Mentor Assessment

10.1 Professional Mentor Name and Role

Rodney Rookey

10.2 Professional Mentor Assessment

There were several goals that needed to be completed on the January 2015 trip to Guachtuq, prior to the May 2015 trip. We needed to evaluate the existing systems that were implemented in 2014. Each new implementation site also needed to be assessed to obtain an accurate quantity of materials. We had to arrange requests for proposals for the procurement and delivery of these materials in May of 2015. The travel team reiterated how to properly clean and maintain the system, although most families had taken the proper steps in maintaining them from previous implementations. We also needed to make sure the community is ready for the implementation in May 2015 with manpower and equally important, enthusiasm. All of these goals were achieved,

Having come into this project midstream, I was withholding judgment until I actually visited the work site. The beauty of this rainwater harvesting system is its simplicity. This simplicity makes it easy for the owners of the previously implemented systems to keep the them maintained and more importantly clean, which nearly every home has been doing as the travelers have suggested. It is apparent these systems will work for many years. It also allowed us to easily determine a required material list and obtain competitive proposals on the purchase and delivery of materials. With the help of CeCEP, the local NGO, I believe all material will be procured and delivered on time and on budget.

The WPI team has a strong relationship with CeCEP. CeCEP is competent and well organized. CeCEP helped with all aspects of the project. They were essential in translating during the two (2) community meetings. These meetings were very well attended by the community members. The community showed much enthusiasm which made it clear to me they understand the value of these systems to their health and quality of life. I believe the community is willing and able to provide the required manpower and construction knowledge in May 2015.

In summary, again the beauty of this system is its simplicity. No pumps, electricity etc. is required for the system to work as designed. I believe due to this design, it will be possible to implement the remaining 24 homes in May 2015. I agree that the WPI teams current 24 home implementation plan is possible and all implementations will be successfully completed.

10.3 Professional Mentor Affirmation

I was the lead mentor for this trip and I take responsibility for the work presented in this document

Appendices:

Appendix A: Monitoring on implemented Systems

House 31:

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean, with divet in the ground
Filter: Clean with strong smell of chlorine

Conversation about the tank:

Only complaint was that there was no water when it wasn't raining, dry for 10-15 days in a row, when there is water in the tank they use it for everything including bathing and washing, it was clarified with the family that this is not how their system was designed
Don't clean the system in the rainy season
Uses the First Flush water to bathe and for the bathroom

House 29:

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean, with divet in the ground
Filter: very dirty and slimy
Old tank in the back feeding off of a gov't roof that we hadn't made a closed system but did add a FF to
Union on the new gutters leaked

Conversation about the system:

Very happy with the system and have plenty of water
Haven't changed anything, just that the union leaks
Uses the government tank to bathe, uses the EWB tank for drinking and cooking
Don't use the water from the First Flush but do empty it
Cleaned the tanks 20 days ago with a kid, and they conserve all the water when they do

House 28:

Actual Observations:

Gutters: Clean
Tank: Clean, maybe use more chlorine (saw more likely small growth than dirt)
First Flush: full but clean, with divet in the ground
Filter: Clean and odorless
Needs a cap for the small hole at the top of the tank
Gutter continues for ~14" past the downspout, possible stagnant water, and should be cut.

Conversation about the system:

Happy with how the system functions
Gone to the finca 3 times since May to wash clothes
Use the tank only for drinking and use the concrete tank for washing
Haven't changed anything about the system
Use the First Flush water for the bathroom
Washed the tanks a month and a half ago, waited until the water got low to clean it
Cleans the tanks with chlorine and soap

House 26

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean, and inside was non functional
Filter: dirty
Overflow (open) and FF (closed) valves don't work
Needs mosquito netting on the old overflow
Also need a cap for the small hole at the top
.5" male adaptor for faucet broke and so until he buys a new one, no use old tank 15-20 days ago
3 italy valves for the FF and inside

Conversation about the system:

Use the EWB tank for drinking
Use the government tank for washing
Haven't had to go to the finca since May
Use the 55 gallon drums to hold the water when they empty the tanks
Use the First Flush for washing
Clean the tanks on different days but more or less at the same time
Secondary overflow is a problem – when the system is really full, they will angle it down to use the water to wash dishes

House 27

Actual Observations:

Gutters: Clean
Tank: first tank was a bit dirty (dirt accumulation in the bottom), second was cleaner
First Flush: full but clean
Filter: dirty and slimy
We need to drill a hole in the elbow of the ff because right now its acting as a siphon

Conversation about the system:

They use the tanks for cooking and drinking
They use the First Flush for bathe
They go to the finca for washing
Empty the First Flush after major rainfall or a couple of smaller rainfalls
When they do have to use the overflow, they put the water in separate containers

Leaks at the old gutter union

House 21

Actual Observations:

Gutters: Clean
Tank: Both tanks have some settled dirt in the bottom
First Flush: full but clean, with divots in the ground
Filter: clean with slight smell of chlorine

Conversation about the system:

System functions well
They use the tank for everything
They use the First Flush for bathing
Not going to the finca at all since May
Cleaned the tanks two times since May
Empty the tank into other containers when they clean it
Said the old roof First Flush would fall when it was opened, not observed
Older brother cleans the tanks
Took down the gutter and cleaned it as well

House 18

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean, with divots in the ground
Filter: Very dirty, smells
Using house 20's roof
Additional gov't tank using small roof gutter

Conversation about the system:

System works well
They cleaned the tanks 2 days previous to the visit for the third time since may
Have only gone to the finca once to wash since May
They keep extra water in small containers when cleaning
They use the First Flush for showering
Have replaced mosquito netting twice
Cleaned with chlorine, noticed that they couldn't get the inside of the tank back to perfect white

House 16:

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean
Filter: clean with slight smell of chlorine

Conversation about the system:

One of the problems is that when they clean it they don't have enough water
Harder for the daughter to clean them because she is getting too big
They empty it out and clean it with chlorine and a brush
Use water in tanks for everything
Don't use the First Flush water
Still go to the finca but not nearly as frequently
When they wash the tanks they wash the filter

House 9

Actual Observations:

Gutters: Clean
Tank: Both EWB tanks were dirty with some settled dirt in the bottom, old government tanks appeared clean
First Flush: full but clean (larger one had cobwebs on the ball valve handle)
Filter: not being used because it was causing a slower flow that continued to get slower as time passed
Tops of old tanks fit poorly and weren't on all the way, was fixed
Old tanks were empty
The overflow pipe in the second new tank had fallen out

Conversation about the system:

Cleaned the gutters the Thursday before
There were problems with the filter- was fixed
Uses the First Flush to wash clothes
When the filter wasn't working they tried to have Roberto fix it
Haven't had to go to finca at all since May 2014
Don't have to find someone to watch their kids when she goes to the finca

House 8

Actual Observations:

Gutters: Clean
Tank: Clean
First Flush: full but clean
Filter: nonexistent

Conversation about the system:

Said the system functioned well
Washed the EWB tank 3 months ago
Washed the government tank twice since may
Cristobal washes them himself
Only gone to the finca twice since may
Use tanks for everything
First Flush for washing clothes
Connections from the gutters to the tank popped out so they glued it in.

House 5

Actual Observations:

Gutters: Clean
Tank: First tank quite dirty, second tank was much cleaner
First Flush: Empty
Filter: clean with slight smell of chlorine
Water is having a capillary effect at the edge of the roof and missing the gutter
Possible to cut and or bend down the roof, thought currently planning on raising the roof

Conversation about the system:

Have not washed or emptied the tank since May, waiting on it to get low before they emptied it
Washed the filter 3 times with chlorine
Empty the First Flush when it rains – use the water to wash and water plants
Lest water sit sometimes before they use it so that dirt can settle out of it
Only gone to the finca once since May to wash clothes
Use the tank for everything
Washed the gutters one month ago

House 1

Actual Observations:

Gutters: Clean
Tank: First tank has some settled dirt, second tank was cleaner
First Flush: full but clean
Filter: clean with slight smell of chlorine

Conversation about the system

Cleaned the tank 5 months ago
Wait for the tanks to empty before cleaning
Use tanks for everything – but prioritize drinking and cooking
Used the finca for the first time since May to wash clothes
Cleaned the gutters – took down and put them back up
Cleaned the filter every 15 days – was torn

Appendix B: The Learning Session Plan

Learning Session Lesson Plan

Purpose

Community children will **know how to** and **be able to** maintain rainwater harvesting systems. Students will be able to **properly clean the tank, use and clean the first flush, and use separate containers for clean and contaminated water**, and they will **understand why** maintaining each part is important. Students will **demonstrate** what they have learned at the end of the lesson.

Organization

2 groups of ~10 students each

- Group 1: Jessie, Aaron, Danny, Professor Stapleton
- Group 2: Katie, Nikos, Amanda, Rodney

Potential Systems (these would be the best choices, in Katie's opinion*I think 5 and 9 are the best choices of these 4 - AP)

- Casa de Filomena Gualim Cal (House 5)
- Casa de Cristobal Lem and Maria Mo (House 9)
- Casa de Roberto Chojoc and Elidia Xona Yuja (House 26, outside)
- Casa de Juan Quej Pop and Marcela Ical Moran (House 30)

Agenda

Total Length: 90 minutes

- Part I: Cleaning the Tank
  - 30 Minutes - EWB Module
- Part II: First Flush
  - 20 Minutes – EWB Module
- Part III: Separation of Containers
  - 10 Minutes – EWB Module
- Assessment:
  - 5 minutes – Instructions
  - 15 minutes – kids break into 3 groups and plan skits related to each of the three areas of instruction
  - 10 minutes – kids perform skits and "teach" the other groups. EWB members give feedback as kids go through the exercise

Materials of Instruction

- EWB Education Booklet
- 2 Rainwater Harvesting Systems

Part I: Cleaning The Tank [Limpiando Los Tinacos]

Learning Objectives:

- Students will be able to name the different types of tank contaminants and explain why they make the tanks dirty
- Students will be able to clean tanks using EWB Best Practices learned from other community members and the provided education manual.
- Students will know how frequently to clean tanks

Key Words:

Contaminado	Contaminated
La Suciedad	Dirt
Los Microbios	Bacteria
El Lodo	Mud
Los Animalitos	Insects
Los Mosquitos	Mosquitos
Los Hojas	Leaves
Los Palos	Sticks
El Tinaco	Tank
La Malla	Mesh
El Techo	Roof
Las Laminas	Roof Panels
El Jabon	Soap
El Cloro	Chlorine
Hervir	To Boil (Water)
Agua Pura	Drinking Water

Essential Questions:

- What happens when we drink water that is not good for drinking?
- What are the main contaminants?
- How do contaminants get into and affect the Rainwater Harvesting System?
- How can water be cleaned?
- How can we prevent water from becoming contaminated?

Development of Lesson:

1. Start by having kids introduce themselves
2. Ask what is my name? what is her name?
3. Ask leading questions that end with key words (like clean)
4. Have kids shout out answers

Water is easily contaminated:

a. Ask these questions to get kids thinking about water quality:
   - Who has stomache aches?
   - Why do you think you get them? - water might be a cause!
   - What makes some water unsafe to drink?
b. There are four main contaminants that can get into the tanks:
   - Dirt – water becomes brown and can have harmful chemicals
   - Sticks and leaves – can clog or break the system
   - Insects – mosquitos and cockroaches in particular
   - Bacteria – cause illnesses
c. How do these contaminants get into the tank?
   i. Roof (el techo/las laminas)
   ii. Gutters (canals)
   iii. Broken mesh (malla)
   iv. It is important to clean frequently - how often do you clean [each part?]

2. Keeping the tanks clean
   a. Ask kids for input on how they clean the tanks. Try to start a discussion that gets them to contribute their personal stories. One person should take notes, as this information might increase our knowledge of current practices. At the end, enforce the following:
      i. Clean the tank at least [four times a year - during vacations]. During the rainy season, tanks will fill quickly
         1. Semana Santa
         2. La Feria En Junio
         3. La Feria de Independencia en Septembre
         4. La Navidad
      ii. Use soap, cloro, and a brush to scrub the inside.
      iii. This is an important job! Make sure kids feel important and that it is their responsibility.
3. Remind kids that water should still be boiled, even when the tank is clean. Never drink water straight from the tank—it can make you sick!

Part II: The First Flush [La Primera Lluvia]

Learning Objectives:

- Students will be able to explain why a first flush is necessary
- Students will be able to explain how a first flush works and how it is used
- Students will be able to take the first flush apart and put it back together

Key Words:

La Primera Lluvia ---------"First Flush" literally "First Rain"
Los Tubos ----------Pipes

Essential Questions:

- What is the role of the First Flush in the system?
- Why is the First Flush important to the system?
- How is the First Flush maintained?
- How is the First Flush Cleaned?

Development of Lesson:

1. The topic changes from cleaning up tanks to preventing the system from becoming contaminated. Have kids draw out what a system looks like, including all the parts. We will be able to see what parts they understand and/or recognize based on the drawings.
2. Did everyone include the first flush? What is it called? What does is its purpose?
    a. The first flush prevents the system from being contaminated by dirt that washes off the roof.
    b. The first amount of rain that falls on the roof is separated. This rain washes the roof clean, and will carry dirt from the roof into the tank if it is not separated.
3. How do you operate it?
    a. Turn the handle! Have a volunteer demonstrate.
4. How does it work? (cut)
    a. water bottle thing
    b. Have the kids help take the first flush apart and observe how the water bottle gets stuck In the reducer as it fills up.
    c. Look inside—any dirt, small leaves, and other debris that gets through the mesh should be caught in the first flush.
    d. When you turn the handle, the contaminated water is released and the sytem is reset. Water can be put into buckets and used for washing clothes and watering plants.
5. DO NOT DRINK water from the first flush

6. The water can be used for bathing and washing clothes!!
7. This MUST be done after every rainfall (like brushing teeth)

Application:

Part III: Separation of Containers [como collecionar la agua]

Learning Objectives:

- Students will be able to explain why separating containers is important
- Students will be able to identify which containers should be used with tank water
- Students will be able to explain the importance of boiling water

Key Words:

Separating Buckets
Cubetitas - small buckets
something special to collect water from EWB tank
Something special for boiled water
"Drinking bucket"
"finca bucket"

Essential Questions:

- Why use different containers for different sources?
- Which uses are most important to keep separate?
- What bucket is only used for clean water?
- Why is drinking water boiled?
- Why is it important to be aware of what container it goes in after its boiled?

Development of Lesson:

1. How do you get water out of the tank? Containers!
2. Do certain containers have different purposes?
3. Are there special containers for water from the finca and special ones for water from the tank?
4. What happens if you use the same bucket you used at the finca to carry water from the tank? What happens to the water?
    a. Water that has bacteria, like the finca water, makes any container it touches dirty and can make your stomach hurt.
    b. Boiling water is the only way to kill all bacteria, because the heat from the fire kills bacteria. (opt)

c. Using separate containers for finca water, which should be used for washing only, and tank water, which should be used for drinking only, reduces the possibility of getting sick if water is not boiled long enough by accident.
d. Don’t mix clean water with dirty container

Application:

Part IV: Application

Application:

1. Ask what the main contaminants are?
2. What are the steps for cleaning a tank?
3. When should you clean the tanks?

Appendix C: Actual Itinerary

Saturday January 3rd
13:00- Flight, Boston to Guatemala City
18:00- Van ride from Guatemala City to San Cristobal

Sunday January 4th
09:00- Team meeting at CeCEP with Sucy and Alvaro
- a. Communicated plans for the May trip
- b. Discussed the Rotary funding for the May 2015 trip

15:00- Community Meeting
- a. Discussed 25 system implementation in May
- b. Discussed the objectives for the week

Monday January 5th
09:00- Talked with all 12 previously implemented homes
- a. Checked on Education Materials
- b. Checked Tank cleanliness and First Flush

Tuesday January 6th
10:00- Discussion with the Municipality Meeting about:
- a. Materials transport, in case there becomes a need to arrange transportation from the Municipality to Guachtuq
- b. Municipality will provide Water for concrete bases in May
- c. Possible Tank or materials storage in the municipality building

12:00- Broke into two groups:

Group 1:
- a. Talked to original 2015 families
  - i. Confirmed design and preparations

Group 2:
- a. Water Quality Tests
- b. Talked to Macsams and Wood store about order quantity

Wednesday January 7th
8:00- Broke into two groups:

Group 1:
- a. Finished talking to original 2015 families and talk to all families that were originally to receive implementation in 2016
  - i. Confirmed design and preparations

Group 2:
- a. Reviewed Materials Inventory at Roberto's
- b. Met with San Cristobal doctor and hospital for local information on illness reports from local communities

17:00- skyped with mentors in the U.S. and President of EWB-USA-WPI
18:00- completed water quality test analysis

Thursday January 8th

09:00 - Community Meeting
a. Discussed May 2015 plan and stress that community involvement is needed to make the May 2015 successful
b. Introduce Rotary travelers and briefly explain the idea of Phase II
c. Documented one family member from each May implementation home who will aid with the implementation.
12:00- Learning Sessions
Split into two groups: one to House 1 and House 9 for Learning Sessions with the children and parents
a. The sessions will cover maintenance of the systems and small details of system construction

Friday January 9th
10:00 - Trip to Santa Cruz
a. Materials Store
b. Quantity and specific items
12:00 - Rotary Club of Coban Visit*
15:00- Asked for quotes from Coban Material Stores

Saturday January 10th
10:00- Met with some families to reconfirm designs

Sunday January 11th
06:00-Van ride from San Cristobal to Guatemala City arrived at 13:00
Flight, Guatemala City to Boston arrived 23:00

*These were activities needed to secure funding for the May 2015 Implementation Trip.

Appendix D: Water Quality Data – Colilert *E. coli* PML

Notes:
NR = No Record
TMC = To Many to Count
Yellow = Bacteria, no *E. coli*
Fluoresce = *E. coli* present
Red Colonies = Bacteria, no *E. coli*
Blue Colonies = *E. coli present*

Date	Number	Location	Yellow/Clear	Fluoresce	Blue Colonies	Red Colonies	Number	Notes
1/6/2015	1	House 1 EWB Tank	clear	no	0	TMC	1	
1/6/2015	2	House 1 EWB Tank	clear	no	0	TMC	2	
1/6/2015	3	House 1 EWB Tank	clear	no	0	2	3	
1/6/2015	4	House 1 EWB First Flush	clear	no	0	11	4	
1/6/2015	5	House 1 EWB First Flush	clear	no	0	TMC	5	
1/6/2015	6	House 1 EWB First Flush	clear	no	0	TMC	6	
1/6/2015	7	House 5 EWB Tank	clear	no	0	2	7	
1/6/2015	8	House 5 EWB Tank	clear	no	0	0	8	
1/6/2015	9	House 5 EWB Tank	clear	no	0	0	9	
1/6/2015	10	House 5 EWB First Flush	yellow	no	0	TMC	10	
1/6/2015	11	House 5 EWB First Flush	yellow	no	0	TMC	11	
1/6/2015	12	House 5 EWB First Flush	yellow	no	0	TMC	12	
1/6/2015	13	House 8 EWB Tank	yellow	no	0	3	13	2 counts illegible (red colonies)
1/6/2015	14	House 8 EWB Tank	clear	no	0	4	14	
1/6/2015	15	House 8 EWB Tank	clear	no	0	3	15	
1/6/2015	16	House 8 EWB First Flush	clear	no	0	33	16	
1/6/2015	17	House 8 EWB First Flush	clear	no	0	40	17	
1/6/2015	18	House 8 EWB First Flush	clear	no	0	29	18	
1/6/2015	19	House 27 EWB Tank	yellow	no	0	4	19	
1/6/2015	20	House 27 EWB Tank	yellow	no	0	11	20	
1/6/2015	21	House 27 EWB Tank	yellow	no	0	12	21	
1/6/2015	22	House 27 First Flush	yellow	flouresce	0	22	22	
1/6/2015	23	House 27 First Flush	yellow	no	0	24	23	
1/6/2015	24	House 27 First Flush	yellow	no	0	18	24	
1/6/2015	25	House 30 Gov't Tank	yellow	no	0	28	25	
1/6/2015	26	House 30 Gov't Tank	yellow	no	0	23	26	
1/6/2015	27	House 30 Gov't Tank	yellow	no	0	31	27	
1/6/2015	28	House 30 Concrete Tank	yellow	flouresce	1	40	28	
1/6/2015	29	House 30 Concrete Tank	yellow	flouresce	0	29	29	
1/6/2015	30	House 30 Concrete Tank	yellow	flouresce	0	30	30	
1/6/2015	31	Alfonso EWB Tank	yellow	no	0	7	31	
1/6/2015	32	Alfonso EWB Tank	yellow	no	0	4	32	
1/6/2015	33	Alfonso EWB Tank	yellow	no	0	NR	33	
1/6/2015	34	Alfonso First Flush	yellow	no	0	6	34	Where first flush leads not recorded
1/6/2015	35	Alfonso First Flush	yellow	no	0	16	35	Where first flush leads not recorded
1/6/2015	36	Alfonso First Flush	yellow	no	0	9	36	Where first flush leads not recorded
1/6/2015	37	Alfonso Concrete Tank	yellow	no	0	18	37	
1/6/2015	38	Alfonso Concrete Tank	yellow	no	0	38	38	
1/6/2015	39	Alfonso Concrete Tank	yellow	no	0	49	39	
1/6/2015	40	Finca	yellow	flouresce	1	65	40	
1/6/2015	41	Finca	yellow	flouresce	1	60	41	
1/6/2015	42	Finca	yellow	flouresce	0	81	42	
1/6/2015	43	Midwife EWB Tank	yellow	no	0	8	43	
1/6/2015	44	Midwife EWB Tank	yellow	no	0	8	44	
1/6/2015	45	Midwife EWB Tank	yellow	no	0	7	45	
1/6/2015	46	Midwife EWB First Flush	yellow	flouresce	0	27	46	
1/6/2015	47	Midwife EWB First Flush	yellow	no	0	25	47	
1/6/2015	48	Midwife EWB First Flush	yellow	no	0	20	48	
1/6/2015	49	Midwife Gov't Tank	yellow	no	0	10	49	
1/6/2015	50	Midwife Gov't Tank	clear	no	0	6	50	
1/6/2015	51	Midwife Gov't Tank	clear	no	0	8	51	
1/6/2015	52	Midwife Gov't First Flush	yellow	no	0	19	52	The major red colonies were counted. TMC for minor colonies
1/6/2015	53	Midwife Gov't First Flush	clear	no	0	20	53	The major red colonies were counted. TMC for minor colonies. One count illegible (red colonies).
1/6/2015	54	Midwife Gov't First Flush	clear	no	1	23	54	The major red colonies were counted. TMC for minor colonies
1/6/2015	55	Miguel EWB Tank	yellow	no	0	12	55	
1/6/2015	56	Miguel EWB Tank	yellow	no	0	13	56	
1/6/2015	57	Miguel EWB Tank	yellow	no	0	10	57	
1/6/2015	58	Miguel Gov't Tank	clear	no	0	12	58	
1/6/2015	59	Miguel Gov't Tank	clear	no	0	16	59	
1/6/2015	60	Miguel Gov't Tank	clear	no	0	8	60	
1/6/2015	61	Miguel Gov't First Flush	clear	no	0	0	61	
1/6/2015	62	Miguel Gov't First Flush	clear	no	0	0	62	
1/6/2015	63	Miguel Gov't First Flush	clear	no	0	NR	63	
1/6/2015	64	Ricardo EWB Tank	yellow	no	0	40	64	2 counts illegible (red colonies)
1/6/2015	65	Ricardo EWB Tank	yellow	no	0	67	65	2 counts illegible (red colonies)
1/6/2015	66	Ricardo EWB Tank	yellow	no	0	120	66	2 counts illegible (red colonies)
1/6/2015	67	Ricardo First Flush	yellow	no	0	6	67	Where first flush leads to was not recorded
1/6/2015	68	Ricardo First Flush	yellow	no	0	10	68	Where first flush leads to was not recorded
1/6/2015	69	Ricardo First Flush	yellow	no	0	15	69	Where first flush leads to was not recorded
1/6/2015	70	Ricardo Gov't Tank	yellow	no	0	28	70	
1/6/2015	71	Ricardo Gov't Tank	yellow	no	0	23	71	
1/6/2015	72	Ricardo Gov't Tank	yellow	no	0	32	66	
1/6/2015	73	Willy's Gov't Tank	yellow	flouresce	0	37	73	
1/6/2015	74	Willy's Gov't Tank	yellow	no	0	12	74	1 count illegible (red colonies)
1/6/2015	75	Willy's Gov't Tank	yellow	no	0	36	75	

Appendix E: Quotes from Materials Stores

DESCRIPCION	U/M	P.U.	TOTAL
NYLON NEGRO	MTS	Q11.50	Q2,334.50
ALAMBRE DE AMARRE	LBS	Q6.50	Q409.50
VARILLAS DE HIERRO 1/4 7/32 COMERCIAL	VARILLA	Q7.80	Q624.00
CODO PVC DE 2'' PARA AGUA POTABLE	UNIDAD	Q15.00	Q840.00
TEE PVC DE 2'' PARA AGUA POTABLE	UNIDAD	Q12.50	Q462.50
TUBO PVC DE 2'' PARA AGUA POTABLE	UNIDAD	Q69.00	Q2,070.00
REDUCIDOR PVC DE 2X 1 1/2	UNIDAD	Q10.00	Q290.00
TUBO PVC DE 1 1/2 PARA AGUA POTABLE	UNIDAD	Q52.00	Q988.00
ADAPTADOR PVC 1 1/2 MACHO A.P	UNIDAD	Q3.75	Q618.75
CEDAZO MOSQUITERO GALV. METALICO	MTS	Q14.50	Q14.50
UNION PVC DE 2'' PARA DRENAJE	UNIDAD	Q5.00	Q40.00
CODO PVC DE 1 1/2 PARA AGUA POTABLE	UNIDAD	Q5.80	Q313.20
TEE PVC DE 1 1/2 PARA AGUA POTABLE	UNIDAD	Q11.00	Q143.00
REDUCIDOR PVC DE 2X3 PARA DRENAJE	UNIDAD	Q8.25	Q16.50
TUBO PVC DE 3'' PARA DRENAJE	UNIDAD	Q70.00	Q70.00
TUBO PVC DE 4'' PARA DRENAJE	UNIDAD	Q105.00	Q630.00
CODO PVC DE 1 1/2 G45'	UNIDAD	Q5.00	Q640.00
TUBO PVC DE 1 1/4 PARA AGUA POTABLE	UNIDAD	Q38.00	Q570.00
ADAPTADOR PVC 1 1/2 HEMBRA A.P	UNIDAD	Q6.00	Q90.00
CHORRO DE 1/2 CAIMAN	UNIDAD	Q24.00	Q576.00
SERVICIO DE FLETE	VIAJE	Q150.00	Q150.00

Figure 7: This is a quote from a store called Salvaje S.A. located in Santa Cruz about 15 minutes outside of San Cristobal.

División DMC Guatemala, S.A.
1a.Calle 16-97 zona 1 Coban A.V

PROFORMA

Orden Comp:
Fecha: **23/01/2015**
Proforma: 350820
Pagina 1 de 2

Cliente CENTRO EDUCATIVO COMUNITARIO POQOMCHI **Cuenta:** **81827**
Dirección 0 calle 0-33, San Cristobal Verapaz.
Teléfono: 5785 5756 -5 *Nit Cliente:* 2016401-7 CONDICIONES DE COMPRA

CODIGO	BODEGA	CANTIDAD	DESCRIPCION DE LA MERCADERIA	U/M	PRECIO UNIT.	TOTAL Q
28647	43	63.00	ALAMBRE DE AMARRE	LIBRA	4.40	277.20
24724	43	975.00	BLOCK (NO ESTRUCTURAL) 14x19x39 25 KGS. PRE	UNIDAD	4.55	4,436.25
34212	43	496.00	BOLSA DE CONCRETO 3001 MAXIPASTA DE 50KG. Coban	UNIDAD	44.00	21,824.00
22236	43	80.00	VARILLA 7/32" X 6.00 MTS	VARILLA	7.40	592.00
24071	43	47.00	BOQUILLA PVC REDONDA 3" PARA CANAL COLONIAL	UNIDAD	30.25	1,421.75
24070	43	47.00	BOQUILLA PVC REDONDA 2" PARA CANAL COLONIAL	UNIDAD	30.25	1,421.75
24068	43	28.00	TAPADERAS PVC PARA CANAL COLONIAL	UNIDAD	16.65	466.20
24081	43	47.00	UNIÓN PVC PARA CANAL COLONIAL	UNIDAD	10.35	486.45
24067	43	11.00	CANAL COLONIAL PVC 6M BLANCO	UNIDAD	278.40	3,062.40
08232	43	56.00	CODO PVC DRENAJE 90 GRADOS 2" PVC	UNIDAD	6.80	380.80
12210	43	37.00	TEE PVC DRENAJE 2" PVC	UNIDAD	9.25	342.25
12454	43	30.00	TUBO PVC BAJADA PLUVIAL 2" PVC	TUBO	46.35	1,390.50
28305	43	29.00	REDUCIDOR PVC LISO 2"X1 1/2" PVC	UNIDAD	16.30	472.70
12442	43	19.00	TUBO PVC 160 PSI 1 1/2" PVC	TUBO	67.50	1,282.50
10578	43	76.00	MULTICONECTOR + VALVULA ESFERA ROTOPLAS	UNIDAD	62.70	4,765.20
28198	43	165.00	ADAPTADOR MACHO PVC 1 1/2" PVC	UNIDAD	4.05	668.25
08396	43	8.00	COPLA PVC DRENAJE 2" PVC	UNIDAD	4.80	38.40
08218	43	54.00	CODO PVC 90 GRADOS LISO 1 1/2" PVC	UNIDAD	5.50	297.00
12196	43	13.00	TEE PVC LISO 1 1/2" PVC	UNIDAD	10.85	141.05
11731	43	2.00	REDUCIDOR PVC DRENAJE 3"X2" PVC	UNIDAD	7.60	15.20
11733	43	26.00	REDUCIDOR PVC DRENAJE 4"X2" PVC	UNIDAD	12.60	327.60
28298	43	17.00	REDUCIDOR PVC DRENAJE 3"X1 1/2" PVC	UNIDAD	6.35	107.95
11733	43	11.00	REDUCIDOR PVC DRENAJE 4"X2" PVC	UNIDAD	12.60	138.60
28298	43	11.00	REDUCIDOR PVC DRENAJE 3"X1 1/2" PVC	UNIDAD	6.35	69.85
12455	43	6.00	TUBO PVC BAJADA PLUVIAL 3" PVC	TUBO	77.40	464.40
12456	43	6.00	TUBO PVC BAJADA PLUVIAL 4" PVC	TUBO	126.00	756.00
17506	43	28.00	LLAVE DE COMPUERTA RED-WHITE 1-1/2" (USA)	UNIDAD	225.00	6,300.00

Figure 8: This is page 1 of the quote received from Construfacil, a store located in Coban, about a half hour drive from San Cristobal.

División DMC Guatemala, S.A.
1a.Calle 16-97 zona 1 Coban A.V

PROFORMA

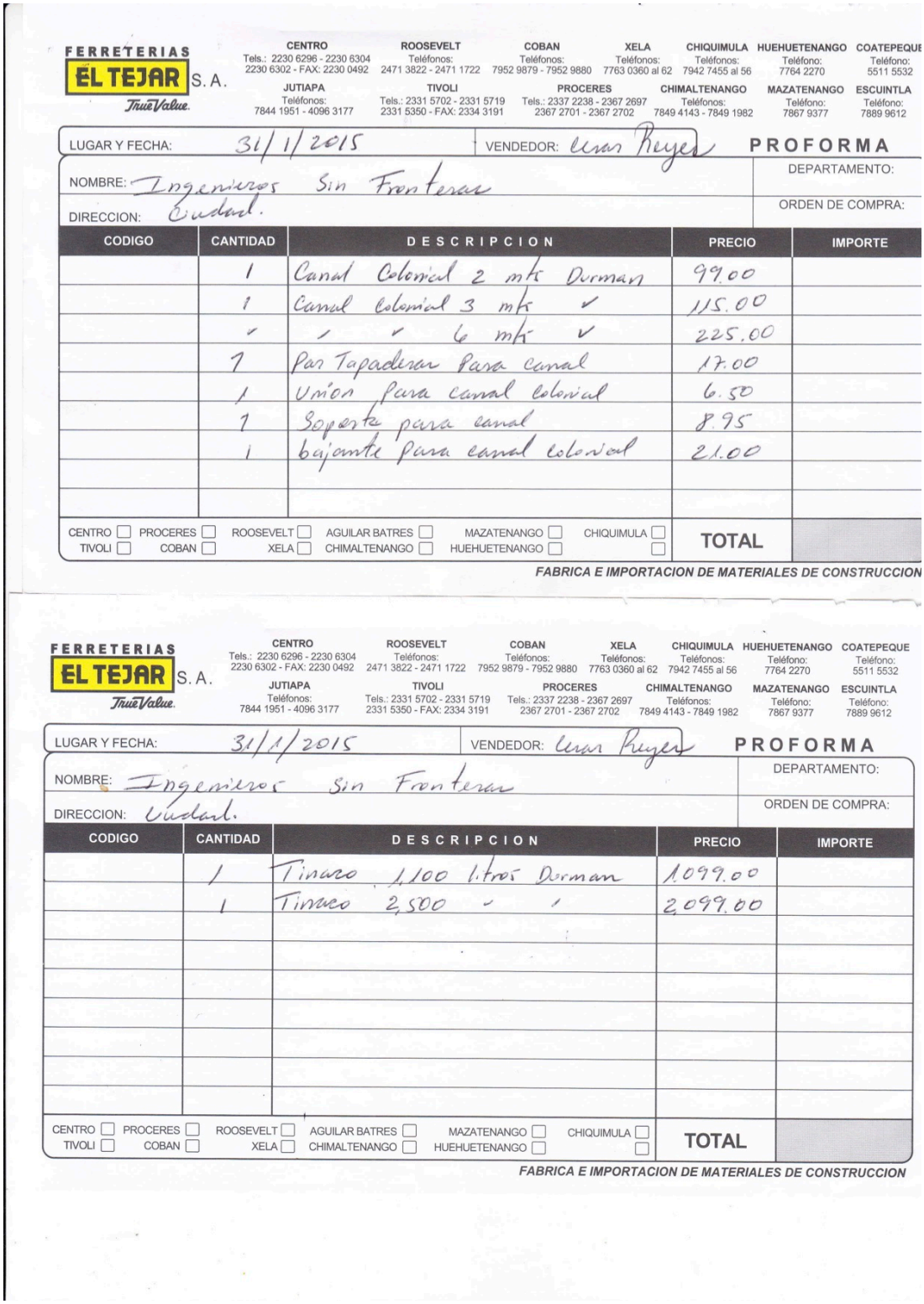
Orden Comp:
Fecha: **23/01/2015**
Proforma: 350820
Pagina 2 de 2

Cliente CENTRO EDUCATIVO COMUNITARIO POQOMCHI **Cuenta:** **81827**
Dirección 0 calle 0-33, San Cristobal Verapaz.
Teléfono: 5785 5756 -5 *Nit Cliente: 2016401-7* CONDICIONES DE COMPRA

CODIGO	BODEGA	CANTIDAD	DESCRIPCION DE LA MERCADERIA	U/M	PRECIO UNIT.	TOTAL Q
08204	43	128.00	CODO PVC 45 GRADOS 1 1/2" PVC	UNIDAD	7.90	1,011.20
08393	43	6.00	COPLA PVC DRENAJE 3" PVC	UNIDAD	10.00	60.00
08394	43	50.00	COPLA PVC DRENAJE 4" PVC	UNIDAD	18.30	915.00
12442	43	15.00	TUBO PVC 160 PSI 1 1/2" PVC	TUBO	67.50	1,012.50
06968	43	15.00	ADAPTADOR HEMBRA PVC 1 1/2" PVC	UNIDAD	4.00	60.00
08395	43	1.00	COPLA PVC DRENAJE 1 1/2" PVC	UNIDAD	6.00	6.00
29783	43	24.00	LLAVE CHORRO DE 1/2" PVC BLANCO CASTEL	UNIDAD	26.00	624.00
08481	43	36.00	DEPOSITO AGUA M/AGUA 2500LTS ROTOPLAS	UNIDAD	2,430.00	87,480.00
20421	43	1.00	TAPON PVC MACHO C/ROSCA DE 2"	UNIDAD	19.50	19.50
10642	43	225.00	NYLON 72 X 6 NEGRO	YARDA	10.10	2,272.50
31509	43	1.00	CEDAZO MOSQUITERO FIBRA DE VIDRIO 1/16 VERDE (YARD	YARDA	4.70	4.70

****Ultima Línea****

Figure 9: this is page 2 of the quote from Construfacil.



FERRETERIAS EL TEJAR S.A. — True Value

CENTRO	ROOSEVELT	COBAN	XELA	CHIQUIMULA	HUEHUETENANGO	COATEPEQUE
Tels.: 2230 6296 - 2230 6304 2230 6302 - FAX: 2230 0492	Teléfonos: 2471 3822 - 2471 1722	Teléfonos: 7952 9879 - 7952 9880	Teléfonos: 7763 0360 al 62	Teléfonos: 7942 7455 al 56	Teléfono: 7764 2270	Teléfono: 5511 5532

JUTIAPA	TIVOLI	PROCERES	CHIMALTENANGO	MAZATENANGO	ESCUINTLA
Teléfonos: 7844 1951 - 4096 3177	Tels.: 2331 5702 - 2331 5719 2331 5350 - FAX: 2334 3191	Tels.: 2337 2238 - 2367 2697 2367 2701 - 2367 2702	Teléfonos: 7849 4143 - 7849 1982	Teléfono: 7867 9377	Teléfono: 7889 9612

LUGAR Y FECHA: 31/1/2015 VENDEDOR: Cesar Reyes **PROFORMA**

NOMBRE: Ingenieros Sin Fronteras DEPARTAMENTO:

DIRECCION: Ciudad. ORDEN DE COMPRA:

CODIGO	CANTIDAD	DESCRIPCION	PRECIO	IMPORTE
	1	Canal Colonial 2 mts Durman	99.00	
	1	Canal Colonial 3 mts ✓	115.00	
	✓	✓ ✓ 6 mts ✓	225.00	
	1	Par Tapaderas Para canal	17.00	
	1	Unión Para canal colonial	6.50	
	1	Soporte para canal	8.95	
	1	bajante para canal colonial	21.00	

CENTRO ☐ PROCERES ☐ ROOSEVELT ☐ AGUILAR BATRES ☐ MAZATENANGO ☐ CHIQUIMULA ☐
TIVOLI ☐ COBAN ☐ XELA ☐ CHIMALTENANGO ☐ HUEHUETENANGO ☐ ☐ TOTAL

FABRICA E IMPORTACION DE MATERIALES DE CONSTRUCCION

FERRETERIAS EL TEJAR S.A. — True Value

CENTRO	ROOSEVELT	COBAN	XELA	CHIQUIMULA	HUEHUETENANGO	COATEPEQUE
Tels.: 2230 6296 - 2230 6304 2230 6302 - FAX: 2230 0492	Teléfonos: 2471 3822 - 2471 1722	Teléfonos: 7952 9879 - 7952 9880	Teléfonos: 7763 0360 al 62	Teléfonos: 7942 7455 al 56	Teléfono: 7764 2270	Teléfono: 5511 5532

JUTIAPA	TIVOLI	PROCERES	CHIMALTENANGO	MAZATENANGO	ESCUINTLA
Teléfonos: 7844 1951 - 4096 3177	Tels.: 2331 5702 - 2331 5719 2331 5350 - FAX: 2334 3191	Tels.: 2337 2238 - 2367 2697 2367 2701 - 2367 2702	Teléfonos: 7849 4143 - 7849 1982	Teléfono: 7867 9377	Teléfono: 7889 9612

LUGAR Y FECHA: 31/1/2015 VENDEDOR: Cesar Reyes **PROFORMA**

NOMBRE: Ingenieros Sin Fronteras DEPARTAMENTO:

DIRECCION: Ciudad. ORDEN DE COMPRA:

CODIGO	CANTIDAD	DESCRIPCION	PRECIO	IMPORTE
	1	Tinaco 1,100 litros Dorman	1,099.00	
	1	Tinaco 2,500 " "	2,099.00	

CENTRO ☐ PROCERES ☐ ROOSEVELT ☐ AGUILAR BATRES ☐ MAZATENANGO ☐ CHIQUIMULA ☐
TIVOLI ☐ COBAN ☐ XELA ☐ CHIMALTENANGO ☐ HUEHUETENANGO ☐ ☐ TOTAL

FABRICA E IMPORTACION DE MATERIALES DE CONSTRUCCION

Figure 10: Materials quote from the third visited store, El Tejar