



Document 901B PROGRAM IMPACT MONITORING REPORT

CHAPTER: **Worcester Polytechnic Institute**
COUNTRY: **Guatemala**
COMMUNITY: **Guachtuq**

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ENGINEERS WITHOUT BORDERS-USA
www.ewb-usa.org

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1.0 INTRODUCTION

1.1 Contact Information and Reporting History

Contact Information			
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Chapter	Worcester Polytechnic Institute
Program Title	Guachtuq Water Supply
Community(ies)	Guachtuq
Country	Guatemala
Date of 502 Approval	2009
# of months between this trip and the previous trip to the site	12
Date of Baseline Study Report (901)	July 20, 2014
Date of This Program Impact Monitoring Report (901B)	July 19, 2016

1.2 Program Summary

The Engineers Without Borders chapter at Worcester Polytechnic Institute aims to provide the community of Guachtuq, Guatemala with a sustainable, year round water supply. Guachtuq is located in the Alta Verapaz region of Guatemala and is home to around 220 people in 36 families. Of their many daily challenges, the absence of clean drinking water is of the greatest concern. In the Guachtuq Water Supply project, EWB-USA WPI directly addresses challenges with water access, and works with the community to learn more about the environmental and social issues that affect their health and water security.

Currently, EWB-USA WPI maintains excellent contact with El Centro Comunitario Educativo Pokomchi (CeCEP), an NGO that works to preserve and educate the Pokomchi community in the region and improve the quality of life for those in need. Sucely Ical Lem (Sucy) and CeCEP volunteers help coordinate travel and homestay logistics, translators, and monitoring. Edghar Gua, one of the volunteers at CeCEP, is employed by EWB-USA WPI to visit families in Guachtuq on a monthly basis and collect monitoring data. This data is sent to EWB-USA WPI who then communicates with Edghar through bi-weekly Skype calls to monitor the state of the project.

Current PMEL Lead Kerry Muenchow underwent PMEL training online watching the webinar video on March 11, 2016. She is majoring in Chemical Engineering with minors in Spanish and Materials Science. Muenchow participated in every Skype call with Edghar and other CeCEP employees beginning in November 2015 to gain a broader context for the project monitoring and evaluation. In preparation for and throughout the trip, Muenchow worked closely with Faculty Advisor Lauren Elgert, Ph. D., to learn about social science research and evaluation methods, indicators, and interviewing practices. Muenchow and Elgert spearheaded community interviews and a series of focus groups in May 2016 to gather information to identify indicators of project success and evaluate the project process.

2.0 PROGRAM IMPACT MONITORING

2.1 Update on Current Community Context

- The Water Committee created during the initiation of the project is inactive and has not existed as a resource for families seeking help with their systems. Conversations with CeCEP revealed that for future projects they recommend working directly with an entity already established within the community.

- HELPS International, an American NGO, distributed ceramic filters called Gravity Water Filters to a handful of families at the homes at the bottom of the community. These filters are housed in buckets separate from the systems implemented by EWB-USA WPI and are used by the families in place of boiling the water. CeCEP expressed their intent to try and work with HELPS or another group to try and get these filters for the rest of the families in Guachtuq outside of the EWB-USA WPI program.
- Two women still sit on the COCODE, (representative governing body of the community). Previously, this has been an all male group. New elections will take place in early 2017 for this body.
- One family with a system moved just outside the community and the terms of the initial contract were successfully handled between CeCEP and the family with little guidance from EWB-USA WPI.
- At least nine new families moved into the community since the last EWB-USA WPI trip. There are two new tiendas, (window front stores) at houses in the community and many previously existing homes had significant changes or new construction on them.
- EWB-USA WPI was presented with a petition from the COCODE to implement five systems on homes for new families in the community. By the end of the week, four additional families added their names to the petition to receive a system. We again explained to the community and the COCODE that we had completed the implementation phase of our project and could not facilitate the construction of five new systems and we encouraged them to find funding for these through other organizations or channels.
- EWB-USA WPI was again approached by individuals of a nearby community asking if a similar project could be initiated in their community.
- CeCEP was approached by two additional communities for assistance in applying for a program through EWB-USA. CeCEP discussed working with the COCODE and individuals with a lot of experience in Guachtuq to help these communities understand the requirements and expectations for a project. CeCEP also intends to bring representatives from these two communities to Guachtuq and promote them as a "model community" in the region.
- Roberto Chocoj, House 26, Vice-President of the former Water Committee has maintained his presence as a resource for community members to go to with questions and problems pertaining to the systems. A few months ago, Roberto was offered a job with a company dealing with water systems because of his extensive knowledge and experience with the construction and function of the systems.
- EWB-USA WPI met with CeCEP and the COCODE to draft and sign a contract transferring responsibility to resolve major issues regarding the project to CeCEP after

EWB-USA WPI project close-out. The contract also encouraged the COCODE to remain available to community members for technical advice or small problems regarding the systems.

2.2 Update on Community-Identified Problems to Address

- The majority of families reported that they have not gone to the finca to get water for drinking or cooking since the implementation of the systems last year. A number of women in the community explained that when their tanks were empty, a neighbor or family member would let them use water from their system for drinking and cooking. This information supports the success of the systems in addressing water quality as families prefer to consume only water from the tanks.
- Some families said that they go to the finca to wash clothes, dishes or to get water for bathing during the dry season. One woman said she never has to go to the finca for water, but will occasionally make the walk to socialize with neighbors or catch up with friends from other communities.
- News sources in the nearby town of San Cristobal reported that this year, Guatemala is experiencing the worst drought in decades due to changes in weather patterns and El Nino. Despite the drought, over 55% of the tanks implemented in the community were observed by the EWB-USA WPI team to be at least half full of water. The finca was at the lowest level ever observed by EWB-USA WPI.
- In focus groups with women from the community, many commented that they have more free time since they do not have to walk to the finca multiple times each day. Many of the women expressed that they do not have to get up at 3 or 4 in the morning to get water, showing the success of the change in access to water in Guachtuq.
- No new water sources have become available to the community

2.3 Update on Change Areas

Change Area	Update on Changes from Baseline Study or Last Program Impact Monitoring Report (please read report guidelines on how to complete this section)
Change in public health	There was no recorded changes in public health noted by the community since implementation. In water quality tests conducted by EWB-USA WPI in May 2016, only three houses out of the 34 were found to have water with a risk level greater

	<p>than 1 as defined by the World Health Organization Guidelines. Both water quality samples taken from the finca had a risk level of 4 or 5 on by the same standards, showing that tank systems implemented by EWB-USA WPI have significantly less harmful E.coli bacteria than the original water source for the community. Water quality tests from previous years yielded results with the majority of the houses having water with a risk level greater than 3 on the same standards, suggesting that there was an improvement in water quality from water in the systems over the years of the project.</p>
	N/A
	N/A
	<p>Questions directly regarding community illnesses and public health were omitted from interviews. It was determined that illness could not directly be attributed to the water source for every family as there are a number of external factors which also contribute. Although tests showed that the water in the tanks had significantly less harmful bacteria than water from the finca, differences in system maintenance between families makes it challenging to directly attribute community illnesses to water quality. Even though there was not a recorded difference in health, a number of families said that they believed the tank water to be cleaner than that from the finca as they noticed less particulates and discoloration at the bottom of the pots when they boil tank water instead of finca water. EWB-USA WPI also modified previously existing tanks in the community to separate them into a closed system and prevent the transfer of dirt between tanks. One of the contributing factors to the improved water quality in the systems was teaching the community what a closed system was and how to ensure that their systems met the criteria to be considered closed. This education reduced the amount of insects and other particulates in the water, which has improved water quality and their sense of improved health. While health data was not directly collected, the reduced risk level with regards</p>

	to the water quality has likely had a positive impact on the health of community members.
Change in environmental health	No changes in environmental health were noted.
	N/A
	N/A
	There was no change in environmental health as the systems have little impact on the surrounding environment. Additionally, collecting water from the finca had little impact on the environment, thus reducing the number of people using the finca has had no measurable effect on the environmental health.
Change in behavior	The most significant change in behavior noted during this trip was the attitudes of community members towards their systems. Previously, many community members felt uncomfortable modifying their own systems if a repair was needed. There was a high interest in the community to learn more about their systems and how best to repair and maintain them. This was seen by high attendance at the Certification Program class run by EWB-USA WPI. Many community members, children included, were excited to help EWB-USA WPI make small repairs to the systems. Following the Certification Program, EWB-USA WPI noticed a change in community members' ability and confidence to make modifications on their own systems. Throughout the trip, members of the COCODE and the community emphasized that the quality of the water available to them was only dependent on their willingness and ability to clean and maintain their individual systems. This shift in language used in the community signified a difference in their acknowledgement of ownership of the systems as they recognized that they were responsible to care for them in order to benefit from clean water.
	High attendance at the Certification Program and involvement in system repairs highlighted a shift in community mentality that they were ready and willing to take ownership of their systems. This change in behavior is important as it will ultimately determine the sustainability of the project.

	<p>To encourage this change in behavior, EWB-USA WPI worked with CeCEP to develop and teach a program about the design, repair and maintenance of the rainwater harvesting systems for community members. This Certification Program included a classroom portion as well as a practical part where community members applied their knowledge doing system repairs in the community with supervision from EWB-USA WPI. Additionally, EWB-USA WPI involved family members in small system repairs done in the community.</p>
	N/A
Change in access to services (water)	<p>All 34 of the EWB-USA WPI implemented systems have been in use for a year and have provided the families with easy access to water at their home. Families with systems no longer have to walk to the finca at the bottom of the community to obtain water, saving some families up to an hour a trip for a single container of water. Recently, due to the severe drought, a few families returned to collecting and using water from the finca. EWB-USA WPI noticed that families who practiced water rationing with their tanks had water security despite the drought.</p>
	<p>The change in access to water saves individual community members hours of time. Many women cited that they spend their new free time working around the house, raising their children, or doing small jobs to earn additional income. Women explained that the most significant effect of this change is that they now have a choice of how they spend their time and they enjoy the freedom that comes with this. Additionally, some women who previously paid others to collect water for them now save this money. Children who used to walk to the finca have additional time to spend on their studies. One child in the community cited that he has time to go to San Cristobal to take computer classes.</p>
	<p>EWB-USA WPI inspected each system twice during the trip and helped facilitate community repairs that would significantly impede the ability of the system to collect or store water.</p>
	N/A

Changes in technical knowledge related to projects	With the help of CeCEP, EWB-USA WPI held three days of classes as part of a Certification Program to teach community members about the design, repair and maintenance of the rainwater harvesting systems. About 40 community members; men, women and children, attended one or more days of the program. During the classroom portion of the program, community members gained hands-on experience with small tasks such as cutting and gluing tubes. The class had the opportunity to ask questions and discuss their systems during a formal presentation in the classroom. The class then broke into teams in the community and performed small repairs on systems. EWB-USA WPI encouraged community members to help with every repair undertaken on the systems.
	Participation in the Certification Program and repairs on individual systems signified a change in community attitudes towards the systems that they were excited to take ownership of the project. Every community member who participated in the Certification Program or repairs in the community left with a greater technical knowledge about system design and function. Certificates of recognition were presented to participants at a graduation ceremony during the final community meeting. This gave many community members confidence in their gained knowledge of the systems and allowed others to see who they can go to for future technical advice.
	During the Certification Program and system repairs, a significant wealth of knowledge about the systems came from community members and CeCEP volunteer, Edghar Gua. During discussions about the system, many community members shared their experiences with system repairs and construction. Edghar also included a lot of input into the curriculum for the Certification Program from his observations monitoring the systems over the past six months. In this way, technical knowledge transfer occurred between the EWB-USA WPI team, community members, and CeCEP volunteers. Edghar continues to

	disseminate technical knowledge about the systems during his bi-weekly monitoring visits in the community.
	N/A
Change in community organization	Members of the COCODE are the same as during the two previous trips. The Water Committee has not acted as a body and was said to be obsolete as an entity in the community. There were discussions with the COCODE about the possibility of adding a sub-group or sub-board within the body to deal with future concerns related to the systems. The next elections for the COCODE are set to occur in January 2017.
	N/A
	N/A
	Cristobal Cojoc, the President of the Water Committee remained to be uninvolved in the project and thus never addressed any concerns related to systems in the community. Although the COCODE mentioned the possible creation of a sub-group in the body to address concerns related to the systems, they acknowledged that there were many discussions and considerations necessary before this could be established.
Change in community self-advocacy	The significant change in community self-advocacy was apparent when the COCODE presented EWB-USA WPI with a petition for the construction of five new systems. In addition to presenting this petition, the COCODE also signed a contract with EWB-USA WPI and CeCEP acknowledging that the administration of the project would be passed to CeCEP in the coming months and the COCODE would address concerns and problems regarding the project before asking for the direct involvement of CeCEP.
	During previous trips, the COCODE had little involvement in the administration or matters regarding the project. The creation of the Water Committee as a body separate from the COCODE was done to separate the representative community body from having direct involvement in the project process.
	Over the years that EWB-USA WPI has been working in Guachtuq, there has been an influx in the number of families in the community. It was expected that bringing water security to the

	community would attract more families to move to the community hoping to get a system. The COCODE petition was a result of this.
	N/A

2.4 Previously Identified Barriers to Program Success (up to 3)

- 1.) Materials Transport:** Because this was a monitoring and evaluation trip instead of an implementation trip, there were no large material transports that the team was relying on to complete the project. There was a slight delay with the delivery of adaptors required to put valves on some systems. This had little effect on the trip as the adaptors were ordered early to mitigate anticipated material delays.
- 2.) Community Involvement:** Throughout the trip there was strong collaboration between EWB-USA WPI, CeCEP, and community members. Community involvement was essential on this trip as EWB-USA WPI aimed to collect a large part of the project evaluation data through interviews and focus groups with community members. Additionally, EWB-USA WPI maintained a focus on transferring knowledge about the systems to community member throughout the trip through the Certification Program as well as involving family members in system repairs. Many community members participated in individual interviews or larger focus groups and almost every woman in the community attended the Certification Program. The widespread community involvement greatly contributed to the collection of valuable project evaluation information during the trip.
- 3.) Community Access to Replacement Parts:** The EWB-USA WPI May 2015 travel team identified this as a barrier to program success. In order to remedy this, EWB-USA WPI created a parts list for the systems, identifying all the parts and materials used in the systems with a picture, their name, where they can be found in the nearby town, and the approximate price. A copy of this list was distributed to every family to facilitate purchasing any necessary parts in the future.

2.5 Previously Identified Facilitators of Program Success (up to 3)

- 1.) CeCEP:** CeCEP continued to provide invaluable help to the EWB-USA WPI team. Throughout the trip, CeCEP provided a number of translators who helped facilitate interviews, focus groups and general communications. Abelino Caal, a CeCEP employee and local teacher, also worked extensively with EWB-USA WPI in designing and teaching the Certification Program and drove team members to Coban for supplies. Sucy Icallem, the director of CeCEP, organized logistics for transportation and lodging for the

EWB-USA WPI travelers. Before the May 2016 trip, Edghar Gua, a volunteer at CeCEP, did preliminary searches for valves and filters in local hardware stores and informed community members about community meetings and the Certification Program. Additionally, Edghar will continue to monitor the project while EWB-USA WPI is not in-country to provide final data for evaluation to determine the next steps for the project.

- 2.) **Community:** Community members were incredibly involved during the trip; helping with small repairs on systems, and participating in individual interviews, focus groups, and the Certification Program. This participation was very valuable to EWB-USA WPI in gaining opinions about the project to use in an overall evaluation. Attendance at the Certification Program was also encouraging as it demonstrated the willingness of community members to take ownership of their systems.
- 3.) **Cooperation of the Municipality and Don Julio:** There were no interactions between the EWB-USA WPI team and the municipality nor Don Julio during the May 2016 trip. A new mayor of San Cristobal was elected and was very busy during the course of the visit, thus EWB-USA WPI did not meet with him. Don Julio, the manager of the Finca la Primavera was neither a help nor hindrance to the project.

2.6 Potential Barriers to Program Success (up to 3)

- 1.) **Change in COCODE:** EWB-USA WPI did not have a working relationship with the COCODE, the local government of Guachtuq, due to corruption during the onset of the project. Since then, the COCODE has changed and EWB-USA WPI has had better relations with the governing body. EWB-USA WPI was informed that elections for the COCODE will be held in early 2017. Although the COCODE was not initially very involved in the project, because of improved governance observed by the travel teams, EWB-USA WPI, the COCODE, and CeCEP signed an agreement acknowledging the COCODE and CeCEP would work to address community questions about the systems and encourage system maintenance. A change in the leadership of the COCODE could potentially result in a lowered commitment of the representative body to the project. While CeCEP was given responsibility for larger issues that could arise with the project, transitioning this responsibility later in the course of the project diminished the presence in COCODE in some decision-making processes. If this transition of power is unsuccessful, it might potentially remove one outlet for community members to gain information or express concerns about their systems.
- 2.) **Community Ownership:** As EWB-USA WPI moves to close the project, it is imperative that families take ownership of their systems in regards to maintenance and repair. If community members do not value their system, families have the potential to inhibit the

success of the project by allowing the construction to fall into a state of disrepair, thus giving these individuals water of a similar quality, quantity and access observed when EWB-USA WPI first initiated the project.

- 3.) Continued Drought Events in the Region:** When EWB-USA WPI conducted monitoring on the systems during the first days of the trip, a handful of systems were found to be empty. After discussions with CeCEP and the community, EWB-USA WPI learned that this year, many parts of Guatemala are experiencing the worst drought in decades. While continued droughts in the region would likely not affect the increased water quality obtained through the project, it would negatively impact the increased water quantity and access achieved with the systems.

2.7 Potential Facilitators of Program Success (up to 3)

- 1.) Impact of the Certification Program:** Almost every woman in the community as well as ten men and sons attended the Certification Program hosted by EWB-USA WPI and CeCEP to learn about how to maintain and repair their systems. As part of this program, many community members also helped EWB-USA WPI to make small repairs and adjustments on the systems. Increasing community knowledge and experience with the systems will likely facilitate good care and maintenance of the system, ensuring the sustainability and impact of the project.
- 2.) COCODE and CeCEP contract:** Anticipating close-out of the program in the coming months, EWB-USA WPI worked with CeCEP and the COCODE to draft and sign a contract transferring the responsibility to make large decisions about the project to CeCEP after close-out is completed. In this document, CeCEP requested that the COCODE be given responsibility to work with the community as a place to voice concerns before transferring problems to CeCEP. The COCODE also indicated their intent to remind and encourage families to maintain their systems, and they hope to be a place where people can come for technical help for any system problems that may arise. The collaboration of these two bodies in overseeing the project past EWB-USA WPI's direct involvement will be a large advantage for this program.

2.8 Analysis of Current Results

Analysis Question	Current Results
To what extent is the program achieving and influencing the planned changes or stated community goals?	The program has achieved its planned goals in increasing water quantity, quality and access to a full extent for 33 out of the 34 families. These

	<p>families have an increased quantity of water available to them and are no longer dependent on the finca. During the first dry season with the systems, some families indicated that they had to go to the finca to collect water to bathe or wash clothes, but only one or two families indicated that they still collect drinking or cooking water from the finca. The one family for which this goal was not met</p> <p>Additionally, the water quality of every system was found to be much higher than that of the finca based on bacterial and turbidity tests.</p>
Where is the program failing to influence the planned changes or stated community goals, and why?	<p>The one house where the objectives of the project are not being met is House 19. The family living in this home was renting the land and was kicked off by their landlord. Because of the EWB-USA WPI's previous experience with a similar situation, the family was able to take their system from the house so the landlord could not take advantage of the project through the terms of the MOU agreements signed with the families. Although the family has the materials to build their system, it is not currently in use and stored at a relative's house.</p>
Are there any negative and or unexpected changes that have resulted from the program implementation? If so, what are they and why did they happen?	<p>An unexpected change that was mentioned during a focus group is that some women will still go to the finca to socialize with neighbors. With the implementation of the systems, some women miss the conversation on the walk to the finca. Women also highlighted that while they sometimes still go to the finca to socialize, they only enjoy the trip because they have a choice of whether or not to go.</p>
Considering all parties involved in the program, how would you describe your chapter's contribution to the	<p>EWB-USA WPI's contribution to the changes in the community are very significant. The project process has been driven predominantly by EWB-</p>

planned/unexpected changes? (Very significant, quite significant, not significant)	USA WPI with help from CeCEP, the municipality, and some community members. In the future, CeCEP, the COCODE, and individual community members will be primarily responsible in contributing to any changes regarding the project.
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2.9 Learning from Current Results

Analysis Question	Current Results
What can your team and EWB-USA headquarters learn from these findings?	<p>It is difficult to begin a monitoring and structured reporting process mid-way through a project, but it is very important to have a set of well defined goals and expectations for the project which are developed with the community to facilitate the project.</p> <p>Sometimes lengthened presence in the community will begin to create a dependency on the EWB-USA team, decreasing the motivation and/or willingness of community members to take full responsibility for sustaining the project.</p> <p>Education about the technical design as well as the implementation should be discussed with the community from the very beginning of the project.</p>
How should the program adapt as a result of the current findings?	<p>Finding the systems mostly in good repair and the community willing and excited to learn about their systems shows that EWB-USA WPI should move towards project close-out. The objectives of the project; to increase water quality, quantity and access have been met for 33 out of the 34 families involved with the project. Before completely closing the project, EWB-USA WPI plans to</p>

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	<p>continue monitoring the systems through Edghar, the CeCEP volunteer, to ensure that the systems continue to be sustainable and to assess the impact of the Certification Program.</p> <p>EWB-USA WPI will evaluate many of the current findings of this trip as lessons learned over the course of the project and hopes to apply them in their future projects.</p>
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3.0 **APPENDIX A – PROGRAM LOGICAL FRAMEWORK** (Document 905)

Program summary	Objectively verifiable indicators	Means of verification	Assumptions
<p>Overall Goal:</p> <p>Achieve and spread sustainable water security</p>	<p>Measures (direct or indirect) the program's contribution to the goal Number of people or families who rely on the finca</p>	<p>Sources of information and methods used to show your contribution to meeting the goal Interviews? Census Surveys</p>	<p>Important events, conditions or decisions beyond the program's control, which are necessary for maintaining progress towards the goal Develop local skills, entrepreneurial spirit, water project/committee leader in the community? Tanks can be purchased or bought inexpensively/subsidized?</p>
<p>Specific Objective: what the team intends to change during the program period (Outcome) Change the way community members use, perceive, and obtain water.</p> <p>Periodic maintenance of tanks, gutters, roofs, first flush, overflow, etc.</p> <p>Community members are willing to designate time, effort, and resources to</p>	<p>Measures (direct or indirect) that the intended change has occurred and is sustainable Separation of water containers, boiling water, Identify when to use finca/tanks</p> <p>Are components broken? Is the water/tank cleaner or dirtier?</p> <p>Community members actively seek opportunities to gain knowledge and experience related to the systems</p>	<p>Sources of information and methods used to show that change has occurred</p> <p>Interviews Monitoring surveys</p> <p>Photo documentation Water quality tests</p> <p>Agree to MOU and uphold clauses in the contract, particularly when we are not in-country.</p>	<p>Assumptions about <i>external factors</i> that need to be in place if the program is to contribute to the overall goal</p> <p>Educational materials are effective</p> <p>Each component must be in working order for the system to function properly Families have the financial ability to maintain systems</p> <p>Education is effective, Community member's jobs are stable and not overly time consuming Community values and relies on the technology they receive</p>

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system maintenance and construction			
<p>Expected Results: the results which should be within the control of the program (Outputs)</p> <p>Increase amount of water available to each family</p> <p>Improve each family's control over water</p> <p>improved water quality from tanks, finca</p> <p>reduce reliance on the finca</p>	<p>Measures (direct or indirect) that the expected results of the program have been achieved</p> <p>Amount of water in tanks Number of trips to finca</p> <p>How frequently do they go to finca? Do issues still arise at the finca?</p> <p>Less pollutants in the water</p> <p>Fewer trips/amount of finca water used</p>	<p>Sources of information and methods used to periodically review results</p> <p>Alvaro trips to community Interviews Surveys</p> <p>Water quality tests Lower frequency of illness</p> <p>Collect monitoring data on finca use and trips to finca?</p>	<p>Assumptions about <i>external factors</i> that might affect whether the specific objective/outcome is achieved</p> <p>The system (first flush, overflow, etc.) effectively improves water quality and quantity as designed. Guatemalan climate can support rainwater harvesting</p> <p>The municipality continues to support transportation of materials,</p> <p>Finca remains open and available to community</p> <p>Families have enough time and financial security to initially implement and maintain the system</p>
<p>Activities: the things which have to be done by the program to produce the outputs</p> <p>Calculate amount of water needed</p>	<p>The inputs and resources needed to carry out each task</p> <p>Create excel spreadsheets Have them reviewed by professional mentors</p>	<p>Proof that each activity/task has been completed</p> <p>Spreadsheet exists and can be used; families do not run out of water</p>	<p>Assumptions about <i>external factors</i> that might affect activities achieving the expected results</p> <p>Preconditions that need to be fulfilled before the program can start</p> <p>Students have enough knowledge to create a working excel model</p>

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and the required system parameters	- rain data, area of roofs, number of tanks, consumption rate for each family		WPI students can safely travel to Guatemala (political, health, bureaucratic red tape, weather, may pose restrictions) Families can afford systems
Build rainwater harvesting systems at each home,	local materials suppliers/hardware stores, water committee, community labor, municipality transportation CeCEP's support and communication	Every family has a rainwater harvesting system that provides adequate drinking water year round	Students have working knowledge to identify appropriate water quality indicators and to analyze data. Tests are available and financially viable.
Water quality testing	Identify and order tests	Results of tests	Rhetorical images exist to communicate ideas, We must assume the community already has an idea about these concepts and is willing to adapt and expand their knowledge base.
produce educational materials to remind families about system maintenance, boiling water, etc.,	Identify rhetorical images and graphics, learn about what images will convey ideas (cultural context), create durable posters	Distribute educational materials with every system we implement, provide CeCEP with electronic copies to produce more if necessary	EWB-WPI has adequate funds to support the project Sucy remains a reliable and trustworthy contact
Transfer money to Guatemala for implementation and monitoring costs	Western union is available Sucy maintains bank account and follows up with community members and Alvaro for money distribution	Everyone pays and is paid	