Assessment – Post-Trip Report

Community:	Comuna Guangaje
Country:	Ecuador
Chapter:	Indianapolis Professional (Lead) and Trine University
Submittal Date:	November17, 2017
Dates Traveled:	September 17th 2017 – September 24th 2017
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Scope of Assessment (100 words)	The scope of the assessment included inspecting and validating the existing water distribution system by obtaining GPS coordinates/elevations of system tankage and household services; performing household surveys to determine water usage and needs, and satisfaction and deficiencies of the water system; inspecting and locating existing and potential new water sources; and assessing functionality and financial capability of the water board.

Privacy: EWB-USA may release this report in its entirety to other EWB-USA chapters or interested parties.

Purpose: To archive, present, and summarize the information gathered during the assessment for review. This includes notes, photographs, sketches, survey information, interview notes, measurements and any other pertinent data.

Instructions:
When completing this report, the chapter should

- Provide all the technical information about the project that was gathered during the assessment.
- Modify the outline of the report if necessary to present the information more clearly. It is your chapter's responsibility to clearly and thoroughly present your project and the results of your completed assessment trip.
- Include additional information relevant to the specific project.
- Provide pertinent figures, tables, and photographs with figure numbers, table numbers and photograph numbers in the section where discussed. Full drawing sets, complete lab reports, and any information larger than 2 pages should be included at the end of the report as an appendix.

Section 1.0:

- Provide a concise description of the assessment sufficient for anyone who had not participated on the trip to understand what happened.

Section 2.0:

- Provide a review and go/no go decision based on the criteria established in the *Assessment – Pre-Trip Plan*. The chapter may decide that the originally proposed project is inappropriate but that another project is feasible. The chapter may also decide that there are no feasible projects in the community.

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Section 3.0:

- Please provide a coherent, brief summary of the information that you collected while at the site. Many times it is useful to display this information in a drawing or in tabular form. You should include all the useful information collected at the site in one or more appendices. Please be sure that the data are annotated for clarity and presented in a coherent fashion.
- Establish subsections for data collection to help organize your report. Please provide maps, tables and photographs where most relevant to the understanding of the report.

Section 4.0:

- Label each photo with a photo number and give a full description.
- Provide a few photos of relevant parts of the project along with a photo number and description. Photos are not limited to this section, please include photos where appropriate. Additional photos taken during the project along with a photo log can be included in an appendix.

List of Attachments:
List all attachments included as separate files, including:

- Signed Final Project Partnership Agreement
- GPS Data
- Household Survey Data
- Mapping
- Water Analysis
- Tanks Sketches and Photos
- Additional Photos

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1.0 Assessment Description

1.1 Community Description

Comuna Guangaje is a small, rural community of approximately 400 residents in Ecuador's Central Highlands region, approximately a 3-hour drive south-southwest of Quito. The community is located at 0.861422°S/78.83505°W (Google Earth) in moderately rugged Andean mountain terrain with an elevation commonly at or above 3,700 meters. The community lies at the head of a valley between three high ridgelines.

September is the end the winter season and the beginning of spring. Weather during this period is commonly clear, dry, and mild with daytime temperatures in the 70's and nighttime lows in the 50's. However, daytime temperatures experienced during the assessment trip were in the 60's with nighttime lows were near freezing and with consistent 20-30 mph winds. Temperature variation is minimal from season to season.

The community's location and altitude make for a semi-arid climate year-round. The area contains a number of natural springs, some of which are high mountain springs while others are lower and feed small creeks in the valley.

The common language is Quichua, an ancient dialect, with Spanish taught in schools as the secondary language. EWB teams working in this area should expect double translation from English to Spanish to Quichua.

The community is comprised of approximately 65 families averaging 4-5 persons per household. Community leaders indicate small, near-term growth to approximately 72 families. Most families are subsistence farmers, growing root vegetables and onions, herding sheep and alpacas, and raising guinea pigs. The community is connected by local bus service to nearby towns of Guangaje Centro (parish center), Pujili, and Latacunga, among others. Some male residents commute via bus to jobs in those areas, while others tend farm plots and flocks. Community women are typically housekeepers who also support farming, herding, and water gathering chores. Inside the community is a small church, K-6 elementary school, and a handful of other public buildings used for community meetings, visiting health clinics, and the water board. There are no notable businesses.

The community has regional electric service to public buildings and most homes and an underground water delivery system from hilltop storage tanks that are only sporadically filled. As a result, water delivery is highly regulated, rationed, and inadequate to meet the needs throughout the community. Sanitation is largely provided by individual privies.

There is no landline telephone capability in the community. While there is cellular phone service around Guangaje, the village's location in a valley beneath higher mountains prevents access inside and around the community proper. Anyone wishing to make a cell call must walk or drive several kilometers to gain altitude and signal access, which even then may be weak. EWB teams operating here will require satellite phone service for reliable communications.

Local residences are generally constructed with concrete walls and tin or tile roofs. Many homes have gutters rigged to catch and divert rainfall to adjacent water storage tanks provided several years ago by SwissAid. Local surveys indicate that annual rainfall, however, is insufficient to fill these tanks more than 2-4 times per year.

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Local transportation involves walking, motorbikes, and bus service.

The community has a significant dependence on nearby Guangaje Centro, which is approximately 2-3 times the size of Comuna Guangaje and serves as the parish seat several kilometers away. Guangaje Centro is the location for the nearest secondary school, active church, and minor clinic with regular hours.

1.2 Existing Infrastructure

Local leaders indicate two water-related international assistance efforts over the past decade. The first was reportedly a USAID effort that resulted in the construction of several water storage tanks (Big Tank, Small Tank 1 and Small Tank 2) above the community and the tapping of several mountain springs to feed them. These tanks are spring-fed to one degree or another, while the fourth tank (High Tank, constructed by the community in 2014) is not connected to any water source. All tanks lie at altitudes allowing gravity flow to the community. This project also included the installation of a gravity-fed, underground network of water pipes from those tanks to individual dwellings as well as the construction of concrete double-sink and faucet wash stations (lavanderias) at or near the majority of homes. Both 2" PVC and galvanized pipes were installed. In some cases, multiple tanks can feed different portions of the network via valve boxes that were also installed at or near tank locations.

Springs intended to feed water storage tanks were crudely tapped and have proved less than reliable because water output is not efficiently captured. Connections from tanks to springs show signs of significant leakage. There is no evidence of spring boxes, which would better capture spring output and likely be more reliable in filling tanks.

Over 90% of the community's homes are served by this system; approximately 6 homes physically lie above the water tanks and cannot be served without extraordinary measures. Those homes are omitted from the focus of this assessment. A full-time operator paid for by the local community water board controls this water storage and delivery system.

Additionally, local leaders indicate the positioning of 2,500-liter, heavy plastic water storage tanks (Section 4.0 Figure 11) at the majority of homes by a SwissAid effort several years ago. The assessment trip found nearly every home equipped with such a tank. Most residents have jury-rigged guttering to capture rainfall from roofs into these tanks. Area rainfall does not typically allow for filling home tanks more than 2-4 times per year. Some have further connected lavanderias to the same tanks and attempt to fill them with water from the underground delivery system as water is available.

While the water storage and distribution system is functional, fairly well maintained, and impressive, it is not adequately fed by water sources to provide regular water availability to those it is intended to serve. Water is consistently rationed, with different segments of the community served in a rotating manner determined by the water board. As a result, all residents frequently revert to collecting water manually from downhill springs and streams when their lavanderias sit empty at their homes.

Visual examples of the existing infrastructure can be found in Section 4.0 Photo Documentation.

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1.3 Community Needs

30 of 66 households as well as community and school leaders in Comuna Guangaje were surveyed regarding water usage. There is high confidence that additional surveys would only have amplified the results obtained. The complete list of survey questions can be found in Attachment C. Survey questions and procedures are addressed in section 3.2.2 Household Survey Data.

The community is highly water-sensitive and appreciates the value of clean water and its subsequent value to health and education. The local parish keeps residents sensitized to the need to boil water and to the merits of clean water for better infant and child development as well as general health for all ages.

The entire community chronically lacks adequate water due to a combination of sporadic rainfall and the inefficiency of the existing water catchment and storage system relative to ground sources. Community water storage tanks are chronically short of water due to the inefficiency of capturing springs to fill them. As a result, the potential of the community's functional water storage and delivery system is significantly under-realized and has become a community disappointment. All surveys indicated major dissatisfaction with water availability from the system, as well as mounting dissatisfaction with having to manually retrieve water.

Survey results indicate the typical household actually uses approximately 15 liters of water per day to meet only drinking and cooking needs, which is substantially below the international norm. Bathing and thus personal hygiene are relegated to secondary priorities as water becomes available. Washing occurs when lavanderias can access water; however, in most cases residents simply take laundry downhill to nearby streams. Residents would ideally like consistent access via lavanderias, sufficient to provide water for drinking, cooking, bathing, and washing. In the absence of that, residents typically haul 20-liter plastic jugs to and from downhill springs and streams to meet their drinking and cooking needs. Local terrain is arduous, and these trips to fetch water are becoming increasingly difficult for families, especially older residents.

Community needs are thus fairly straightforward. Good, clean water is available to the community from a variety of springs that are either poorly harnessed or not harnessed at all. Improvements to springs feeding community water storage tanks need to be made in the form of better water capture. Jury-rigged roof catchment systems need to be improved to optimize collection of rainfall. Additional springs are available to be captured as inputs to water storage tanks.

2.0 Go/No Go Decision

2.1 Feasibility Requirements

2.1.1 Community Ownership of the Project

The community takes water and water management seriously. A formal, 5-member water board exists and has been operating with discipline for several years in a very close working relationship with the community at large. The board

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is organized with a president, secretary, treasurer, system operator, and two additional members. All members are elected to 2-year terms. The current president is also the head of the parish (broader community) water board. Among other community activities, local assessment saw clear evidence that the water board is a well-structured, representative, and disciplined group that does its best to serve residents and which the community at large takes seriously.

There is a strong, multi-year history of water board responsibility and accountability in the community. Water is the most serious community need and shortfall, and local leadership is eager to work with agencies capable of improving water access.

2.1.2 Community Capacity to Financially and Operationally Sustain a Water System

With local parish support, the community is capable of providing materials and services in kind toward EWB's 5% community investment. This can include materials and services required for spring box-related improvements, which is important given the need to upgrade existing springs and to potentially tap additional springs as water sources for storage tanks.

The water board currently assesses a monthly water fee of $1 from each of the 66 households in the community. From that, $30 is paid to the system operator/maintainer, $26 is typically spent on administrative and maintenance costs, and the remaining $10 are saved. This appears to be sufficient for the community's current circumstances and needs, which largely involve system operator actions to control water distribution and tend to minor repairs.

Community leaders indicate the potential to raise additional funds if users can be guaranteed a sufficiently higher and more regular availability of water from the distribution system. Water board leadership indicated the potential to charge and receive an additional $2-3 per month from each family if water access can be substantially improved.

Spring boxes to improve existing water source inputs to storage tanks would be a highly sustainable solution in this community due to the focus and rigor of the water board. The community is trainable and appears very capable of addressing regular spring box maintenance, as it is already very capable of addressing the maintenance and sustainment of significant existing infrastructure.

Any decision to harness additional springs and electrically pump water from them to storage tanks will involve the cost of tapping into existing electrical infrastructure and paying regular electricity bills. Community leaders are aware that this could involve significant new cost relative to the current fee structure and that any such option would require a major community conversation about affordability. This will be addressed in a subsequent analysis of alternatives, to include early presentation to community leaders for a sanity check.

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2.1.3 Community Ability to Participate in the Program Financially (i.e. 5% Contribution) and With Local Unskilled and Skilled Labor

See para 2.1.2 above. The assessment team's out-brief with Comuna Guangaje included participation from the community water board, community president, and the head of the local parish government. These leaders all indicated their willingness and ability to supply building materials, materials transportation, and labor toward new construction that EWB might seek to do. The community's ability to raise funds in lieu of materials, services, and labor is low.

2.1.4 Capacity of EIA to Assist in the Program

Engineers in Action (EIA) is a Tulsa-based NGO focused on working with indigenous peoples to address critical needs in sustainable ways, has a strong operating history with multiple projects in Bolivia, and is in the process of expanding project operations in Ecuador. A country office has recently been established in Quito with a permanent program manager and administrator. In partnership with EWB-USA, EIA would formalize the project in Comuna Guangaje and provide necessary in-country oversight and assistance with EWB-USA needs. See http://engineersinaction.org for additional details of EIA performance in South America.

The combined Indianapolis Professional and Trine University Chapters partnered with EIA's Ecuador team for this assessment trip. Support was excellent prior to and during the assessment phase, and there is high confidence that it can continue. EIA appears to be dedicated, eager, and capable of supporting future EWB team missions in the area.

(Additionally, there is the potential in this project to also work with Timmy Global Health (see https://timmyglobalhealth.org), an Indianapolis-based NGO focused on improving indigenous health in Central and South America (including Ecuador) and Africa. Timmy Global Health is exploring health-related missions in the Guangaje area.)

2.1.5 Technical Feasibility

Improving the reliability and quantity of water to the community would involve feasible technical solutions as discussed in Section 2.2 below.

2.1.6 Chapter's Ability to Provide Technical and Financial Support of the Program

In combination, the Indianapolis Professional Chapter and Trine University Student Chapter are capable of providing both technical and financial support to a project in Comuna Guangaje and would execute any implementation project under a joint partnership.

The Indianapolis Professional Chapter has a solid history of funding and executing overseas projects through fundraising, grants, and other sources and has the requisite technical and mentor capability and capacity to support such an effort.

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The Trine University Student Chapter is relatively new but has an energized student group mentored and advised by a highly committed faculty under highly supportive university leadership. Technical capabilities in civil and environmental engineering are excellent. The university realizes and accepts the need to also raise funds in support of any implementation project.

Travel to Ecuador is relatively easy, and community access is good. Living conditions during the assessment trip were spartan, and EIA representatives are seeking nearby facilities to better house implementation teams. Health and safety risks are minimal and manageable, the most notable being the risk of altitude sickness which is mitigable with acclimatization in Quito for 24-36 hours prior to travel to Comuna Guangaje.

2.2 Possible Alternatives

2.2.1 Optimize Existing Springs Catchment with Spring Boxes

Existing sources of water for storage tanks are springs located in Spring Areas 1, 3 and 4 as shown on Attachment D.4. Spring Area 1 comprises at least four separately piped spring catchments that flow into sedimentation/junction boxes as shown in Attachment F. Assessment showed no spring is efficiently tapped to capture and optimize water flow into its respective tank(s). Pipes appear to be inserted into each spring, which is then covered up and subject to significant (observed) leakage. As a result, the construction of spring boxes to better harness spring output for tank input is a natural and fundamental part of any improvement project.

It appears that none of the catchments have spring boxes, rather pipes laid in a gravel seam where the spring emerges from the hillside and covered with native soil. In Spring Area 1, the flow from the sedimentation boxes can be directed to the Big Tank and/or to a separate distribution leg via valves located adjacent to sedimentation/junction box.

Spring Area 3 is similar to Spring Area 1, with multiple catchments without spring boxes and separate pipes flowing into sedimentation/junction boxes and onto to Small Tank 1.

Spring Area 4 has one catchment without a spring box and a separate pipe flowing Small Tank 2. Water system operator said that every two years the catchment is excavated down 2 meters and refilled with stone to improve the flow from the spring.

High Tank currently does not have any spring source (if it existed, it would be Spring Area 2). It was constructed by the community to serve 3 homes above Big Tank. High Tank is approximately 400 meters to the east of Big Tank and is 126 meters higher than Big Tank. There does not appear to be any springs that could flow to High Tank by gravity. High Tank could be filled by pumping water from Big Tank.

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Construction of spring boxes in the catchments in Spring Areas 1, 3 and 4 would improve the flow from these spring catchments. If the spring boxes were constructed during the dry season, the flow from the springs would be more reliable during the dry season.

2.2.2 Optimize Rain Catchment in the Community

While the majority of homes have guttering to catch sporadic rainfall, most observed guttering is primitive and sub-optimal for its purpose. An effort could be made within the community to optimize rainfall catchment from roofs.

2.2.3 Connect to New Source

The community identified a substantial, untapped spring source (identified as Quiloa) approximately 3 kilometers to the north of Big Tank. The source is also 324 meters lower than Big Tank. The pipeline route would traverse through very rugged terrain and would require double pumping. See Attachment D.2.

2.2.4 Connect to Alternate Source

Another source (Alternate Source) is within the community and was identified during one of the household interviews. It is located approximately 1 km north-east from Big Tank, 114 meters lower than Big Tank and had an estimated flow measured on 9/21/17 of 50 liters/minute. Compared to a design community daily water consumption of 7000 liters, this spring could potentially provide 72,000 liters per day.

2.3 Go/No Go Conclusion

A Go conclusion has been made based upon the following review of criteria established in the *Assessment - Pre-Trip Plan* to determine whether the chapter will continue with the project of partnership:

- *Community ownership of the project*: Yes. The community has a well-established and functioning water board.
- *Community capacity to financially and operationally sustain a water system*: Yes. Water board currently collects $1 per month from each household connected to the water system and properly disburses those funds in operation and maintenance to sustain the system. The water board indicated the potential to charge an additional $2 – 3 per month from each household to improve the water system.
- *Community ability to participate in the program financially (i.e. 5% contribution) and with local unskilled and skilled labor*. Yes. The community has the skilled labor to construct concrete tankage and install piping as evidenced by the community's construction of High Tank in 2014. The water board is currently saving $10 per month for new construction and committed to providing transportation of materials.
- *Capacity of EIA to assist in the program*. Yes. EIA effectively provided technical and logistical arrangements the assessment trip. EIA's project manager assigned to the project is technically qualified.

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- *Technical feasibility*. Yes. As noted above, four possible alternatives have been identified, three of which are technically feasible.
- *Health and safety*. Yes. E-coli contamination was not found in the existing system, even though the water supply is not chlorinated. The household interviews confirmed that water is being boiled for consumption.
- *Chapter's ability to provide technical and financial support of the program*. Yes. Indianapolis Professional Chapter is well-experienced in the construction and financing of spring boxes.

3.0 Data Collection and Analysis

3.1 Site Mapping

Using AutoCAD, a map of important water system components and the general water storage and delivery system was created. See Attachment D.4 Revised Distribution Map.

3.2 Technical Data Collection

3.2.1 Field Survey Data

Surveyed points taken around Comuna Guangaje denote the location of crucial elements of the current water system. Surveyed points include water storage tanks, springs, valve units, and other accessible springs. These points were taken with a professional (Magellan) survey unit, which relies on a homed in unit and access to at least five satellites. The homed unit was stationed inside the gates of the community on the soccer field and had consistent access to a dozen satellites. The components of the water system and their corresponding GPS coordinates can be found in Attachment B.. To double check the accuracy of the Magellan, less accurate hand-held GPS units were used to record the locations of facilities above as well as households.

3.2.2 Household Survey Data

As indicated in the Feasibility Requirements section, household surveys were conducted at individual residences within the community. The household survey team consisted of three EWB members accompanied by a representative from EIA who acted as an English-Spanish translator, as well a community member who acted as a Spanish-Quechua translator. Frequently, additional community members accompanied the group on these visits. A schematic map of the community was drawn by Comuna Guangaje leadership prior to the group's arrival (Attachment D.1). This map indicates the relative location of each household, with 66 homes in total connected to the existing distribution system.

Based on this map, the community was broken down into quadrants for survey. These quadrants can be further divided into groups of homes connected to individual water mains. Due to time constraints, the team opted to obtain a good representative sample of homes in each quadrant, with special attention paid to homes at the beginning, middle, and end points of the water system serving that quadrant. At the end, all branches of the water distribution system were surveyed.

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The questionnaire developed by the team covered a variety of topics relating to each household's water usage, including health-related information desired by Timmy Health and with whom the team coordinated prior to travel. A full list of questions asked is located in Attachment C.

The main goals of the survey can be grouped into the following three categories:

1) Determine how water is currently obtained and used
2) Understand what changes community members would like to see in their water infrastructure
3) Gauge understanding of water related health issues and the value placed on clean water

Survey responses are tabulated and are included in Attachment C. Survey responses were found to be highly consistent across households. The main takeaways that can be gathered from the household survey responses are summarized as follows:

1) Most households have a connection to the distribution system at their "*lavanderia*" (washing station). For some homes, this is directly outside of the house. For others, this may be located several hundred feet downhill. Households will use this as their water source when water is available at the tap. As previously indicated, there is inadequate capacity to serve the entire community at a given time. During dry periods, there are a number of ways in which water is collected. Many homes have 2,500-liter (blue plastic) storage tanks on site. Some homes fill these from the distribution system when operational and use the stored water during the weeks or months with no water. Others fill these tanks via a rain catchment system. Most supplement their water by carrying buckets from nearby springs.

2) Community members near unanimously would like to see consistent water supply available at their homes as system designers originally envisioned. Many asked for taps inside. Another frequent response was that they would like water to be brought from "*Quiloa*" (identified as New Source in this report). Several older individuals noted the difficulty they have gathering water. Some cited that lack of readily available water had caused some to move away from the community.

3) Almost all community members said they received ongoing training on water and sanitation issues through workshops put on by the health center in Guangaje Centro. Almost all households said that they boiled their water prior to drinking.

A separate survey was used to question teachers at the local K-6 elementary school. Based on the responses, the team learned that the school does not have a potable water connection for drinking and highly desires one be installed.

3.2.3 Community Leadership Survey Data

A separate questionnaire was used for community leadership. These questions were selected to help provide insight into the community's capacity to sustain any

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water system improvements that may be made. Questions were posed to the existing water board. A complete list of members is included in Attachment C.

Important knowledge gleaned from this session includes information on the community's financial capabilities. The water board currently assesses a monthly fee of $1 from each of the 66 families in the community. From that, $30 is paid to the system operator/maintainer, $26 is typically spent on administrative and maintenance costs, and the remaining $10 are saved. This appears to be sufficient for the community's current circumstances and needs, which largely involve system operator actions to control water distribution and tend to minor repairs. The board believed that households would be willing to pay an additional $2-$3 per month if consistent water supply were to be available.

Another important topic discussed was the community's arrangement with the Ecuadorian water governance committee, Senagua. The local president is a member of this authority. Currently, Senagua has granted the community rights to the springs they currently use as well as potential New Source (Quiloa). Per discussions with the committee, their rights could be transferred if a different source were to be developed.

3.2.4 Water Sampling and Analysis

Water sampling was done at several locations.

Location 1: Lavanderia within the Community Compound
Location 2: Spigot within the Old School Building
Location 3: Alternative Source Pool
Location 4: Alternative Source Spring

Parameters measured included: E-coli, other coliforms, hardness, alkalinity, pH, Total Chlorine, Free Chlorine, Nitrite, Nitrate,

See Attachment E. for results of testing. Other than minimal indication of non E-coli coliforms, the water sampled at Locations 1 and 2 met drinking water standards. Alternative Source Spring had minimal indication of non-E-coli coliforms.

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4.0 Photo Documentation

4.1 Existing Infrastructure

Figure 1: Big Tank

Figure 2: Small Tank 1

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Figure 3: Small Tank 2

Figure 4: High Tank

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Figure 5: Spring 1 Junction Box 2 and outlet valve box to Big Tank

4.2 Water Sources

Figure 6: Alternative source Quiloa from vantage point.

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Figure 7: Input to alternative source Quiloa.

Figure 8: Possible new source.

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4.3 Households and Community

Figure 9: Survey #27 home view with rain catchment system example.

Figure 10: Photo 10: Survey #27 house lavanderia example.

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Figure 11: Survey #30 rain catchment example and 2500L blue tank.

Figure 12: Survey 31 rain catchment system example.

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5.0 List of Locally Available Material Costs

Construction of spring boxes will likely be required to improve the reliability and supply of water for the community. The following materials could be used in the construction of spring boxes:

Material	Unit	Price ($)
Bag of Cement	50 kg	8.24
2" PVC drainpipe brand "Rival"	3 meters	3.80
2" PVC drainpipe brand "Plastigama"	3 meters	5.00
2" PVC potable water pipe	6 meters	42.29
Rebar of 5.5 millimeters diameter	6 meters	1.45
Rebar of 4.5 millimeters diameter	6 meters	1.18
Pressed concrete block	15 cm x 20 cm x 40 cm	0.50
Light concrete block	13.5 cm x 18 cm x 38 cm	0.37

Sand, large or small stones and gravel are available from nearby mines at a cost of $30 per 8 cubic meters. The cost to transport these materials to the community is $120 per 8 cubic meters. Pressed block is stronger than light block and comes in a standard measure.

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List of Attachments

A. Signed Final Project Partnership Agreement
B. GPS Data
C. Household Survey Data
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    D.2 New and Alternative Sources Map
    D.3 Tank and Topographic Map
    D.4 Revised Distribution Map
E. Water Analysis
F. Tanks Sketches and Photos
G. Additional Photos

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Attachment A – Signed Final Project Partnership Agreement

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Community Agreement – Project Partnership

EWB-USA projects are most successful when there is a three-way partnership between each of the entities listed below. Each partner has specific skills and expertise, which together, contribute to a more sustainable project over the long-term.

- **Community** - Community-Based Organization (CBO) and Community Members (*Examples include: water board, community development committee, women's committee, village council, etc.)*
- **Local Partner Organization(s)** - Local NGO and/or municipal/city government
- **EWB-USA Chapter**

This contract is between Indianapolis Professional Chapter of Engineers Without Borders, USA, Comuna Guangaje Water Board, and Engineers in Action for the purpose of setting guidelines for Community Water Supply Project. **The roles and responsibilities listed below must be included in the standard EWB-USA Project Partnership Agreement.** Additional roles and responsibilities identified by any party to the agreement may be added at the discretion of all parties to the agreement. This document must be signed by all parties in order to move on to the design development of Community Water Supply Project.

EWB-USA is a volunteer-based organization without a pre-approved budget. Implementation of all projects is contingent upon all parties meeting the commitments outlined below, funds being raised and a stable security situation which allows travel to the site by our members. This agreement is not legally binding, but is intended to clarify expectations, roles and responsibilities of all parties to the subject project.

The residents of Comuna Guangaje agree to the following:

- To communicate directly with the Indianapolis Professional Chapter of EWB-USA on a regular basis, as determined by the needs of the project.
- To inform Indianapolis Professional Chapter of EWB-USA of any changes to the security/safety situation.
- To allow Indianapolis Professional Chapter of EWB-USA to communicate directly with all interested community groups in order to get all pertinent input to the development of Community Water Supply Project.
- To organize and involve community members in all aspects of the project.
- To identify community contacts to accompany the Indianapolis Professional Chapter of EWB-USA team during site visits.
- To ensure that Community Water Supply Project represents community-wide priorities and that all community members will have the opportunity to benefit from the project per the terms of use established by the community.
- To contribute a minimum of 5% of the capital construction cost in cash before construction begins.
- To provide in-kind contributions to the project at no cost to Indianapolis Professional Chapter of EWB-USA (*examples are skilled and unskilled labor, borrowed equipment, local materials, etc*.).

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- To identify a formal system of responsibility for the operations and maintenance of Community Water Supply Project.
- To establish and administer the funding mechanism required to continually operate and maintain Community Water Supply Project after construction is complete.
- To be available to assist with additional technical data collection not completed by Indianapolis Professional Chapter of EWB-USA on site assessment trips.
- To allow photos or video taken by Indianapolis Professional Chapter to be used in EWB-USA HQ's marketing materials to share the story of the organization's work with wider audiences.

Engineers in Action agrees to the following:

- To inform Indianapolis Professional Chapter of EWB-USA of any changes to the security/safety situation.
- To visit Comuna Guangaje Water Board often, and as needed, for project progress.
- To build the capacity of Comuna Guangaje Board to establish continuing support of the system, as needed.
- To provide project-specific training for Comuna Guangaje Board, as needed.
- To identify contributions that the Engineers in Action can make to the project (*examples include funding, resource procurement, heavy equipment, etc.*)
- To assist in ongoing monitoring and evaluation of Community Water Supply Project.
- To be available to assist with additional technical data collection not completed by Indianapolis Professional Chapter of EWB-USA.
- To allow photos or video taken by Indianapolis Professional Chapter to be used in EWB-USA HQ's marketing materials to share the story of the organization's work with wider audiences.

Indianapolis Professional Chapter of EWB-USA agrees to the following:

- To work in partnership with Comuna Guangaje Water Board to design and develop the project, Community Water Supply Project.
- To seek input from community members during the design phase
- To communicate with Comuna Guangaje Water Board and Engineers in Action throughout project design phases to provide status updates on project design development.
- To identify contributions that the Indianapolis Professional Chapter of EWB-USA can make to the project construction expenses (*examples include fundraising, assistance with community grant applications, etc.*).
- To inform Comuna Guangaje Water Board and Engineers in Action of any changes to the agreed upon details of site visits (*examples include a change of dates, number of travelers, etc.).*
- To collect technical data required to complete the project design.
- To provide project-specific education and training, including operations and maintenance training in Spanish.
- To provide a manual to instruct the community on operations and maintenance of Community Water Supply Project in Spanish.

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- To provide as-built drawings to Comuna Guangaje Water Board after project completion in Spanish.
- To acquire explicit permission before photographing or videoing members of the Comuna Guangaje Water Board and/or Engineers in Action, and explain that photos and videos may be used for marketing materials to share the EWB-USA story with wider audiences.
- To ensure photographs and videos present subjects in a dignified and respectful manner and that images are honest representations of the situations and the facts.

In addition to the responsibilities listed above, indicate the responsible party for each of the following:

- Coordination of transportation for travel team members of Indianapolis Professional Chapter of EWB-USA will be provided by Engineers in Action.
- Coordination of translation services for travel team members of Indianapolis Professional Chapter of EWB-USA will be provided by Engineers in Action.
- Transportation of materials will be coordinated by Engineers in Action.

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On behalf of, and acting with the authority of the residents of Comuna Guangaje, the NGO/local municipal partner Engineers in Action and Indianapolis Professional Chapter of EWB-USA, the under-signed agree to abide by the above conditions.

	November 10, 2017
Signature Roger C. Ward	Date
Printed Name +1-317-435-7145 Contact Telephone Number (including country code) Responsible Engineer in Charge	
Position in Indianapolis Professional Chapter of EWB-USA	

Signature Felipe Vasquez	Date
Printed Name +593960349547 Contact Telephone Number (including country code) Project Manager	
Position in Community-Based Organization	

Signature Luis Toaquiza	Date
Printed Name +593997912705 Contact Telephone Number (including country code) President of the Water Board	
Position in Local Partner Organization	

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Attachment B – GPS Data

		Latitude		Longitude		Elevation	
Structure	Number	(degress)	(UTM coord)	(degress)	(UTM coord)	(ft)	(m)
Houses	2	-0.86582	741142	-78.83319	9904232	12265	3739
	3	-0.86519	741161	-78.83302	9904302	12222	3726
	4	-0.86522	741190	-78.83276	9904298	12199	3719
	6	-0.86592	740990	-78.83456	9904221	12287	3746
	7	-0.86587	741014	-78.83434	9904226	12253	3736
	12	-0.8624	740882	-78.83553	9904610	12063	3678
	13	-0.86215	740890	-78.83546	9904638	12075	3681
	14	-0.86181	740893	-78.83543	9904676	12066	3679
	16	-0.86165	740990	-78.83456	9904693	12095	3688
	17	-0.86089	741106	-78.83352	9904777	12081	3683
	20	-0.862	741147	-78.83315	9904654	12054	3675
	23	-0.859	740995	-78.83452	9904986	11952	3644
	24	-0.85844	740972	-78.83472	9905048	11903	3629
	26	-0.87275	740809	-78.83618	9903466	12561	3830
	29	-0.87136	740757	-78.83665	9903619	12471	3802
	30	-0.8709	740694	-78.83721	9903670	12483	3806
	31	-0.87035	740690	-78.83725	9903731	12467	3801
	32	-0.86924	740694	-78.83721	9903854	12399	3780
	34	-0.868	740708	-78.83709	9903991	12340	3762
	41	-0.86559	740688	-78.83727	9904258	12274	3742
	41b	-0.86152	740630	-78.83779	9904708	12149	3704
	47	-0.86055	740687	-78.83728	9904815	12083	3684
	50	-0.86159	740706	-78.83711	9904700	12137	3700
	50	-0.8607	740787	-78.83638	9904798	12074	3681
	53	-0.86067	740891	-78.83545	9904802	12052	3674
	59	-0.85415	740431	-78.83958	9905523	12216	3724
	60	-0.86053	740526	-78.83872	9904817	12157	3706
	66	-0.85887	740589	-78.83816	9905001	12041	3671
	68	-0.86015	740735	-78.83685	9904859	12049	3673
School	--	-0.8613	740913	-78.83525	9904732	11755	3584
Break Tank	Garmin	-0.8596	741044	-78.83419	9904911	12068	3679
	Magellan		741032		9904907	12113.04	3693
Small Tank 1	Garmin	-0.86545	741054	-78.83398	9904273	12304	3751
	Magellan		741053		9904275	12346	3764
Small Tank 2	Garmin	-0.86578	740788	-78.83637	9904237	12202	3720
	Magellan		740788		9904205	12254	3736
Spring 3	Garmin	-0.86606	740785	-78.83640	9904206	12218	3725
	Magellan		741948		9904050	12467	3801
High Tank	Garmin	-0.87189	741399	-78.83088	9903628	12817	3908
	Magellan		741398		9903559	12881	3927
Big Tank	Garmin	-0.87128	740789	-78.83636	9903628	12440	3793
	Magellan		740785		9903619	12526	3819
New Source	Garmin	-0.8454	740470	-78.83924	9906491	11333	3455
Altern. Source	Garmin	-0.8636	741284	-78.83192	9904477	12057	3676

Data Differences between Garmin and Magellan	
elevation (m)	straight distance (m)
14	13
13	2
16	32
76	1173
19	69
26	10

NOTES:
(1) All houses, the school and the new source (by the river) and the alternate source (spring south of compound) shot with handheld Garmin GPS.
(2) Structures marked identified as "Magellan" shot with EIA survey equipment.

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Attachment C – Household Survey Data

Comuna Guangaje and Associated Leadership POC's

(Collected during Oct 17 Assessment Trip)

Comuna Guangaje Water Committee

First	Last	Role	Contact Info (Precede w/ 0)
Luis Eduardo Toaquiza	Guanoquiza	President	997972705
Jose Vargas	Latuala	Secretary	967676958
Juan Manuel	Toaquiza Tigasi	Treasurer	969877944
Cesar Latuala	Pastona	Primary Assistant	
Maria Eshtey Vargas	Manzano	Secondary Assistant	
Jose Agosten Latuala	Manzano	Water System Operator	967534292

Other

Jose Manuel Latuala	Pastona	Community President	
Jorge	Toaquiza	President, Parroquia Board	99106560

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Attachment D – Mapping

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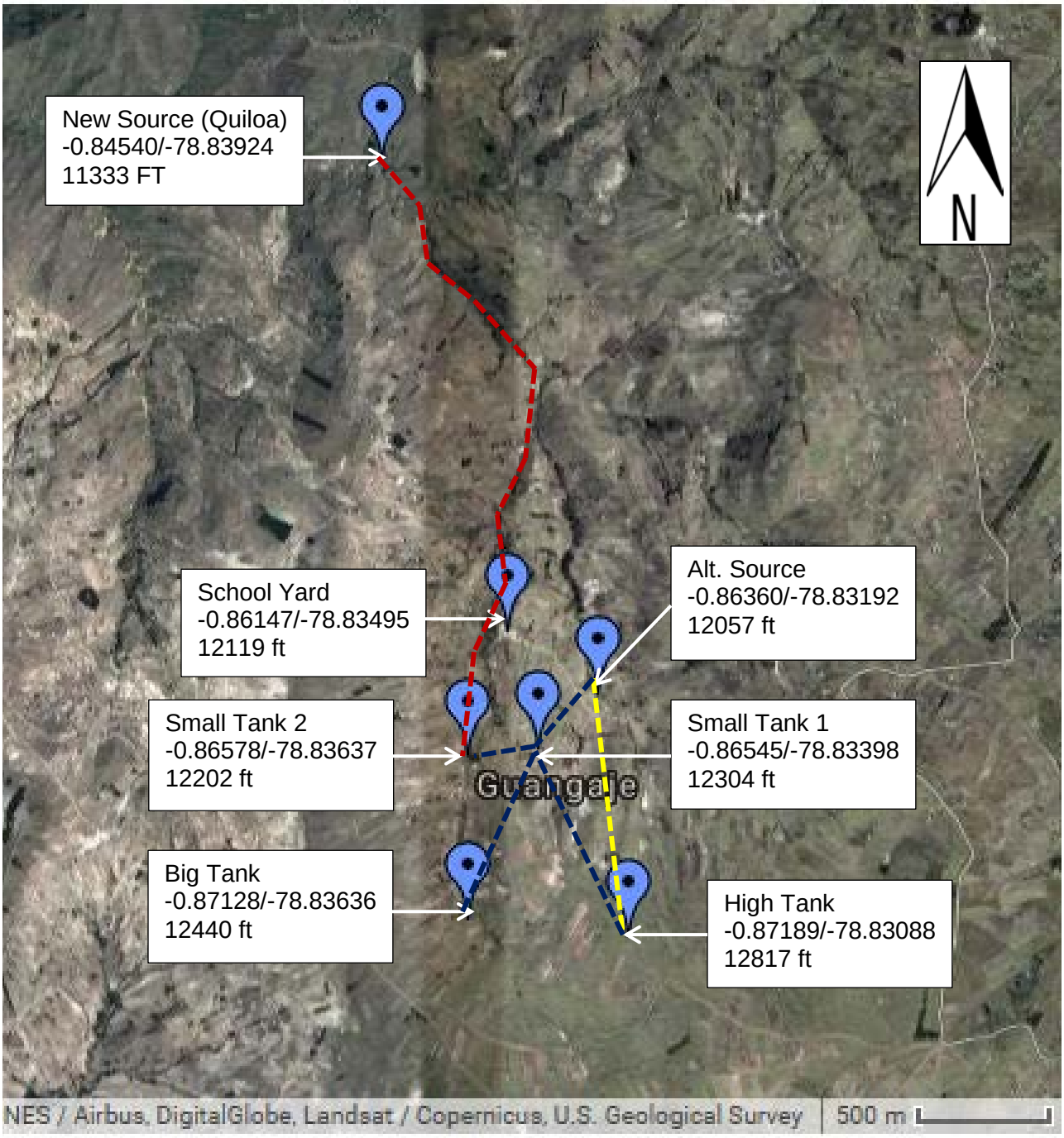
D.1 – Distribution System Map (original)

D.2 – New and Alternative Sources Map



Horizontal Distances and Elevation Change Between:

New Source 1 to Small Tank 2 – 2.5 km, 869 ft

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Alt. Source to High Tank – 0.95 km, 760 ft

Alt. Source to Small Tank 1 – 0.4 km, 247 ft

Small Tank 1 to Small Tank 2 – 0.3 km, -102 ft (gravity flow?)

Small Tank 1 to Big Tank – 0.7 km, 136 ft

Small Tank 1 to High Tank – 0.8 km, 513 ft

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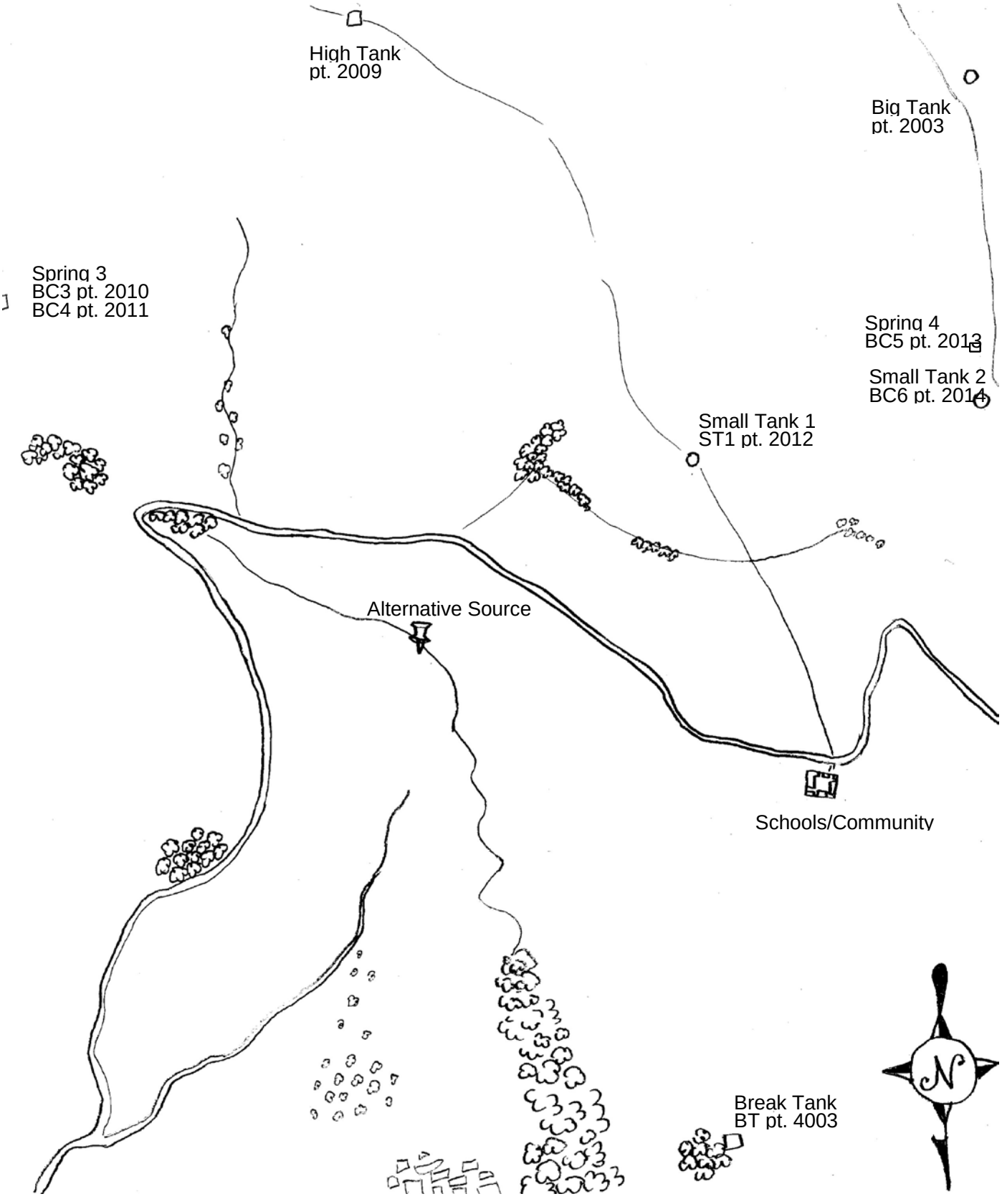
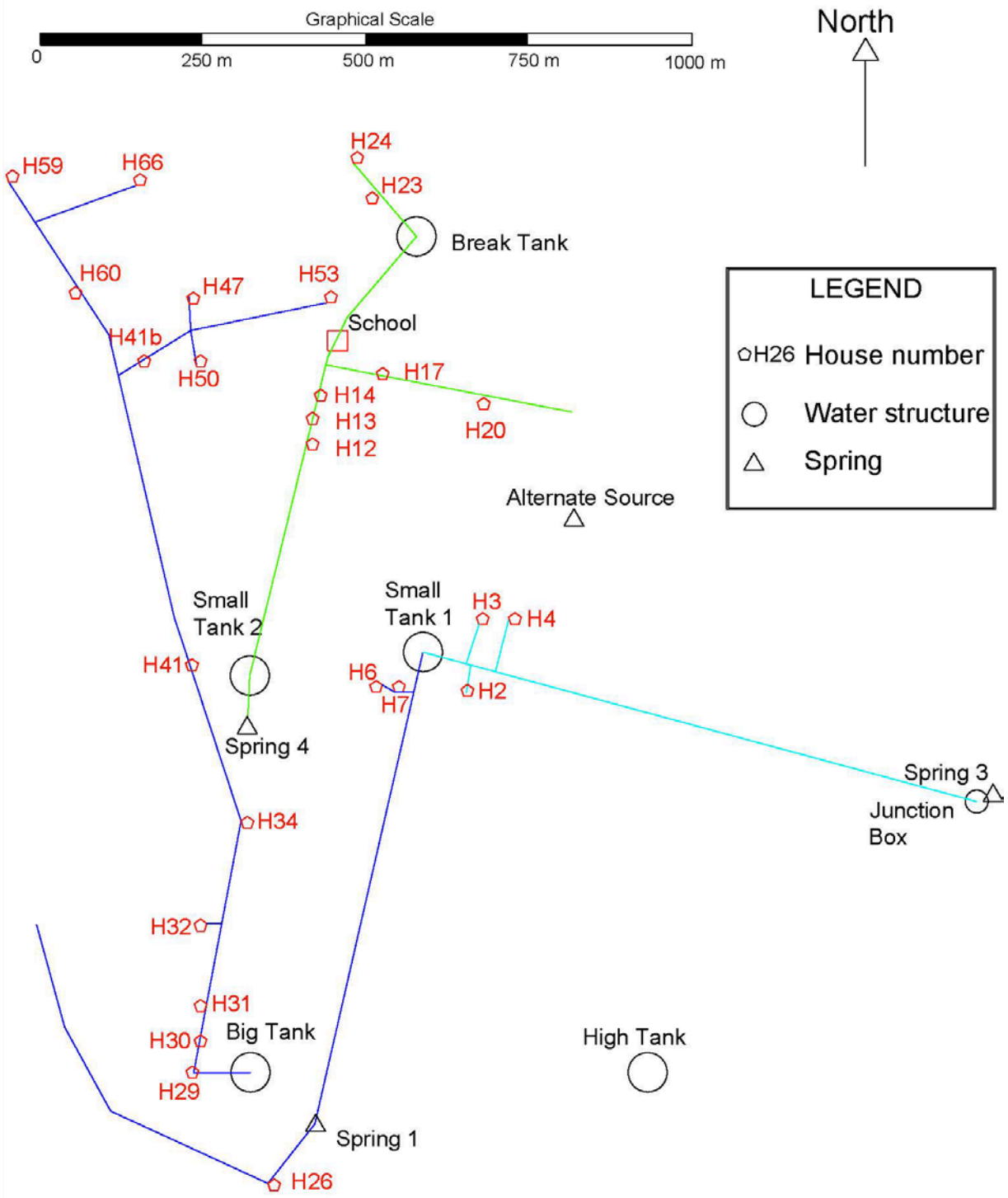
D.3 – Tank and Topographic Map



D.4 – Revised Distribution Map



Attachment E – Water Analysis

Comuna Guangaje Water Quality Testing 9/20/17

Parameter	Wash Station at School	Spigot inside School	Alternate source pool	Alternate source spring
E-coli (counts/ml)	0	0	0	0
Other coliforms (counts/ml)	1	1	31	1
Hardness (ppm)	250	250		
Alkalinity (ppm)	240	240		
pH	7.0	7.2		
Total Chlorine (ppm)	0	0		
Free Chlorine (ppm)	0	0		
Nitrite (ppm)	0	0		
Nitrate (ppm)	2	2		

Notes:

Wash Station at School and Spigot inside School connected to same source.

E-coli and coliform tests were performed with Coliscan Easygel test kits incubated at 95^{o}F for 24 hours.

Other tests performed with HACH test strips.

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Attachment F – Tank Sketches and Photos

F.1 – Big Tank

Figure 11: Big Tank outlet valves.

Figure 14: Big Tank.

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Figure 15: Big Tank valve box.

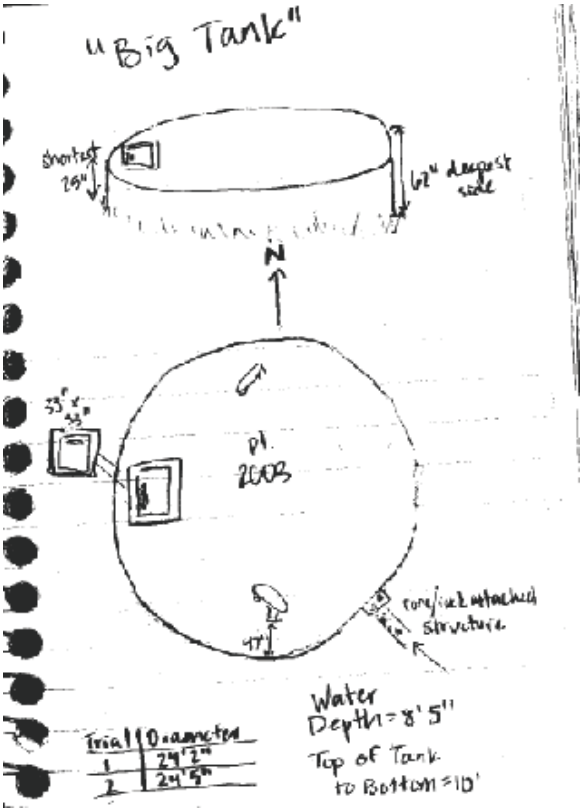

Figure 16: Big Tank field sketch and dimensions.

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F.2 – High Tank

Figure 17: High Tank.

Figure 18: High Tank covers.

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Figure 19: High Tank view of community.

Figure 20: High Tank date constructed.

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Figure 21: High Tank valve box.

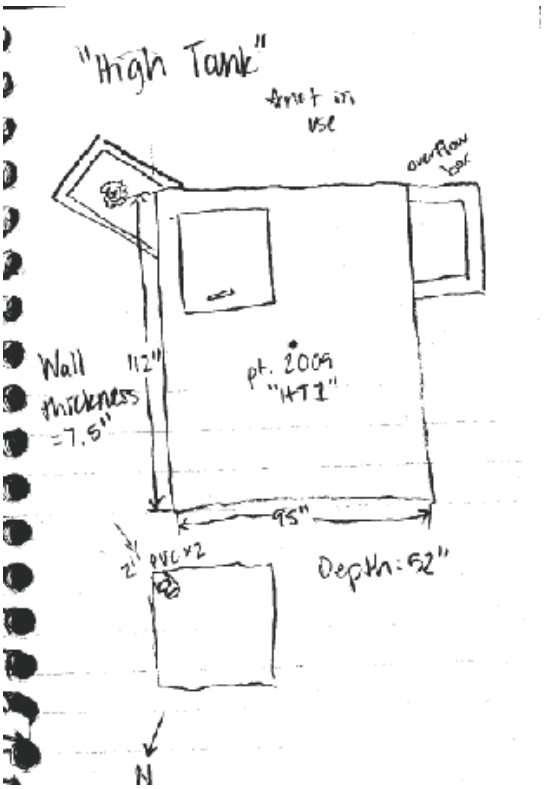

Figure 22: High Tank field sketch and dimensions.

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F.3 – Break Tank

Figure 23: Break Tank.

Figure 24: Break Tank.

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F.4 – Small Tank

Figure 25: Small Tank 1.

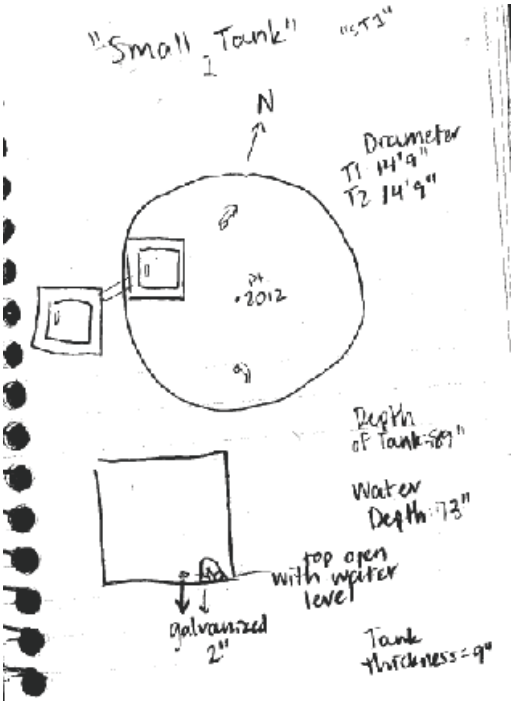

Figure 26: Small Tank 1 field sketch and dimensions.

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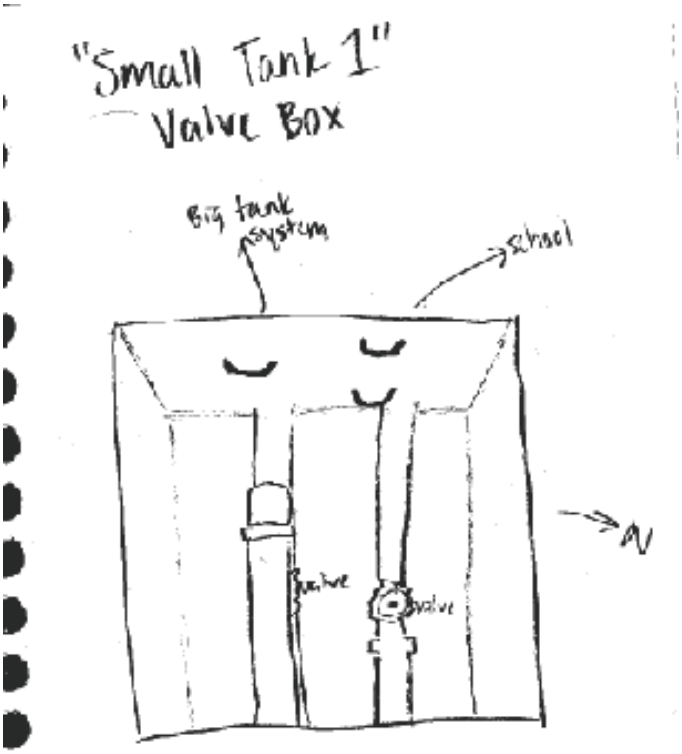

Figure 27: Small Tank 1 valve box field sketch.

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F.5 – Small Tank 2

Figure 28: Small Tank 2.

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F.6 – Spring 1

Figure 29: Inside Spring 1 Junction Box 2.

Figure 30: Spring 1 Junction Box 2.

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Figure 31: Spring 1 view north.

Figure 32: Spring 1 view south.

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Figure 33: Spring 1 outlet valve box to big tank.

Figure 34: Inside Spring 1 sedimentation box.

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Figure 35: Inside Spring 1 sedimentation box.

Figure 36: Spring 1 junction box and outlet valve to Big Tank.

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Figure 37: Spring 1 Junction Box 1 (pt. BC1).

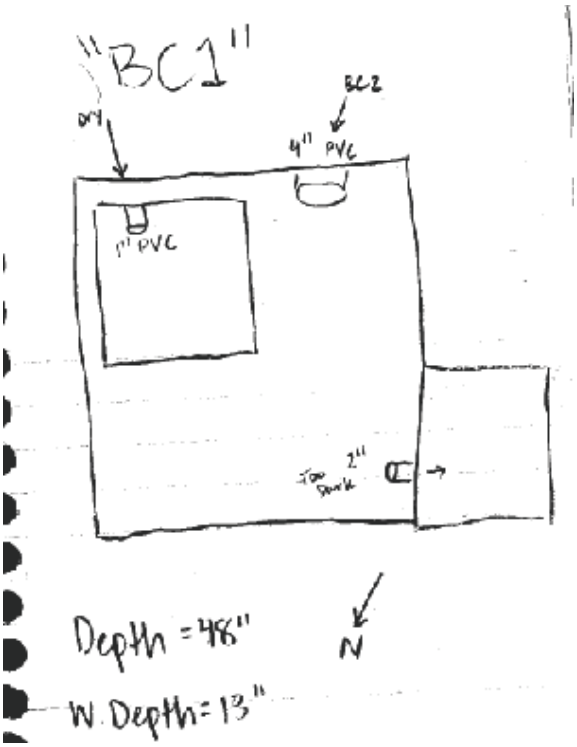

Figure 38: Spring 1 Junction Box 1 (pt. BC1) field sketch and dimensions.

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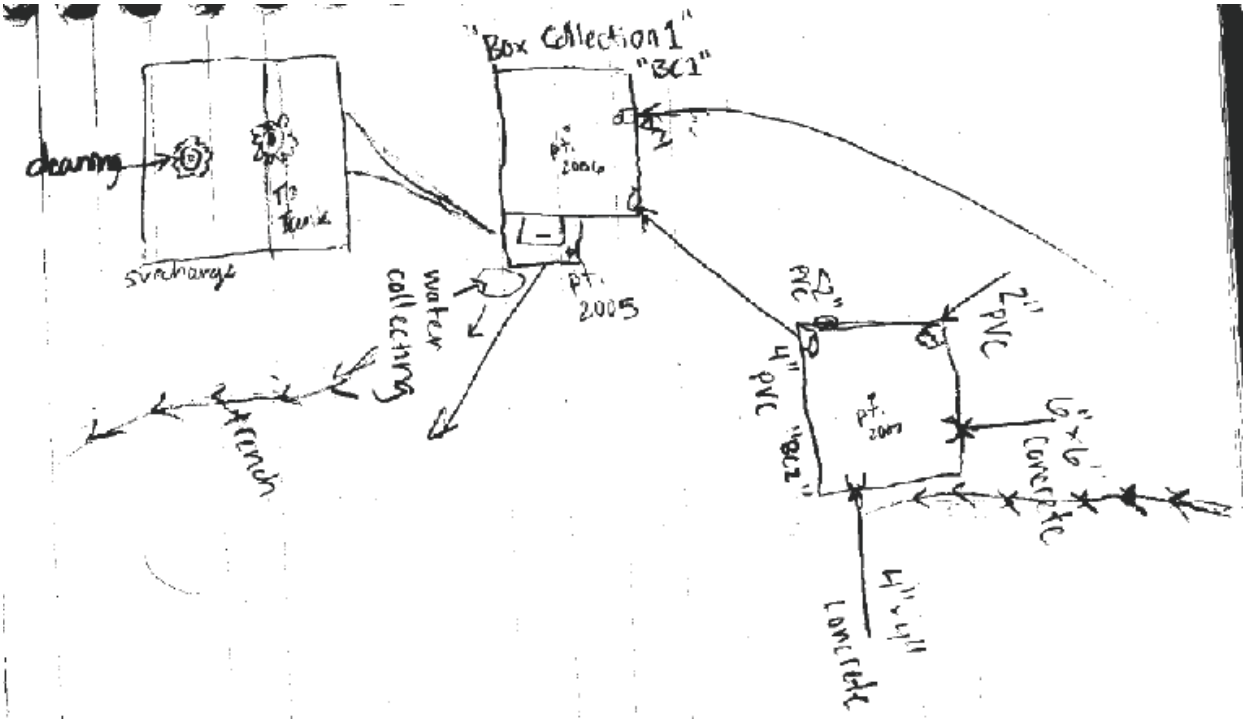

Figure 39: Spring 1 field sketch.

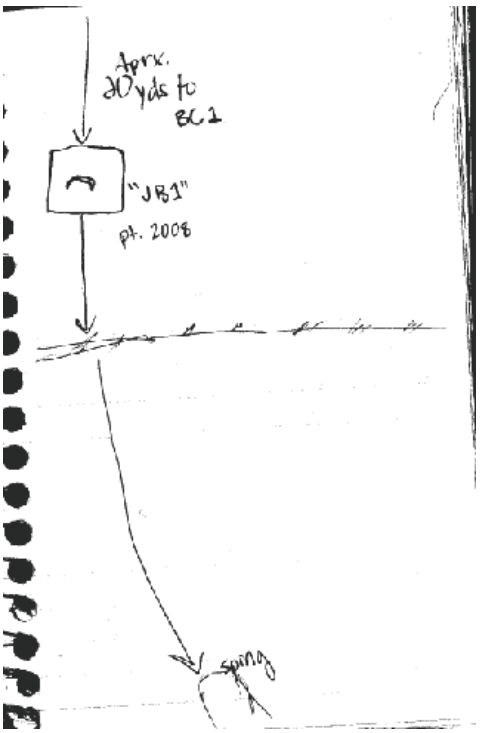

Figure 40: Extension of Spring1 (pt. JB1) field sketch.

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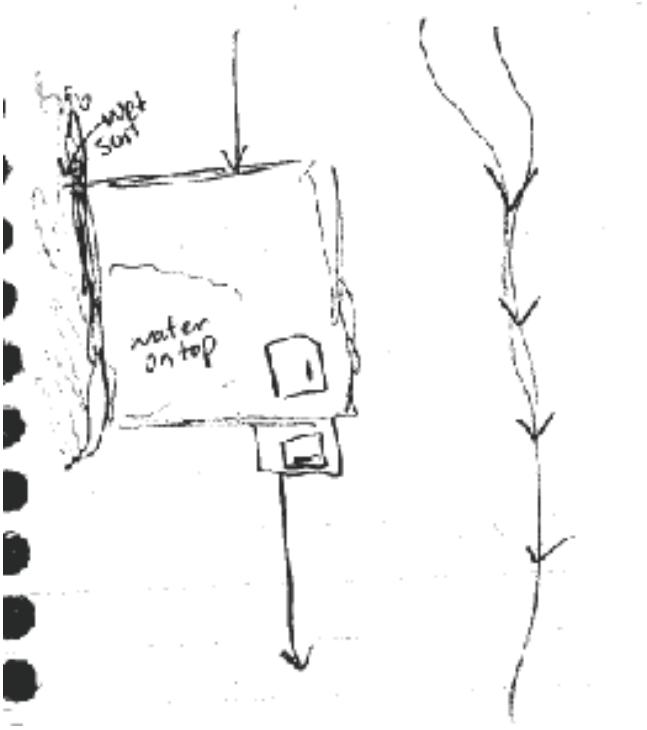

Figure 41: Extension of Spring1 field sketch.

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F.7 – Spring 3

Figure 42: Inside Spring 3 outlet box (pt. BC3).

Figure 43: Inside Spring 3 outlet valve box (pt. BC3).

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Figure 44: Spring 3 (pt. BC3).

Figure 45: Spring 3 upper sedimentation box (pt. BC4).

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Figure 46: Spring 3 abandoned sedimentation tank.

Figure 47: Inside Spring 3 abandoned sedimentation tank.

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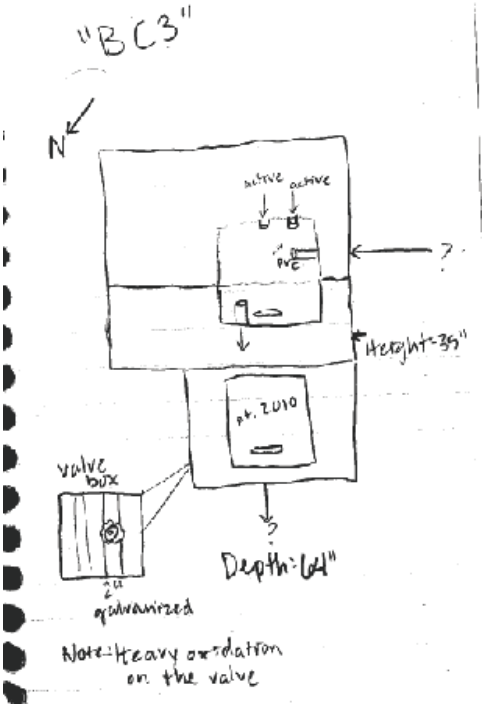

Figure 48: Spring 3 (pt. BC3) field sketch.

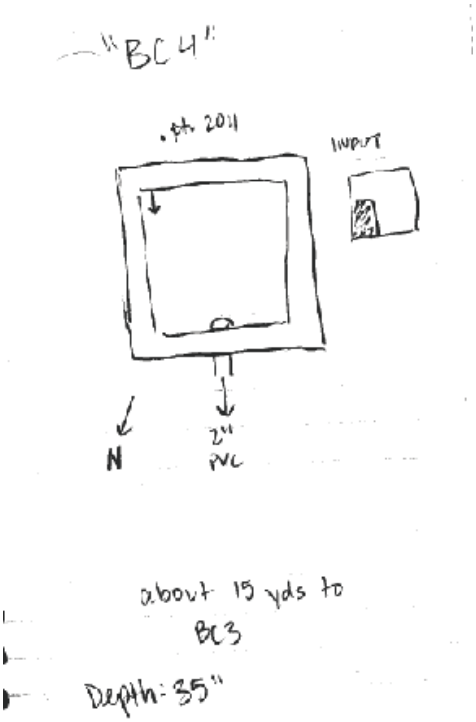

Figure 49: Spring 3 (pt. BC4) field sketch.

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F.8 – Spring 4

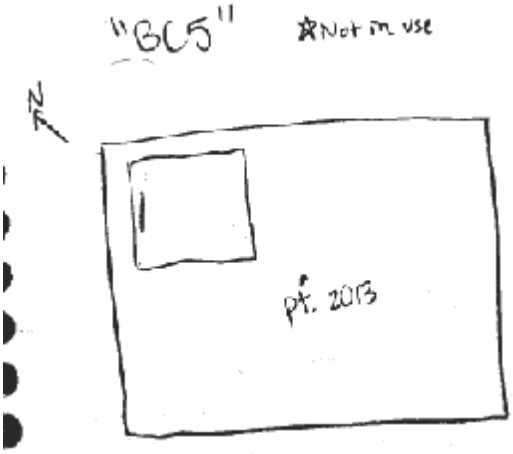

Figure 50: Spring 4 (pt. BC5) field sketch.

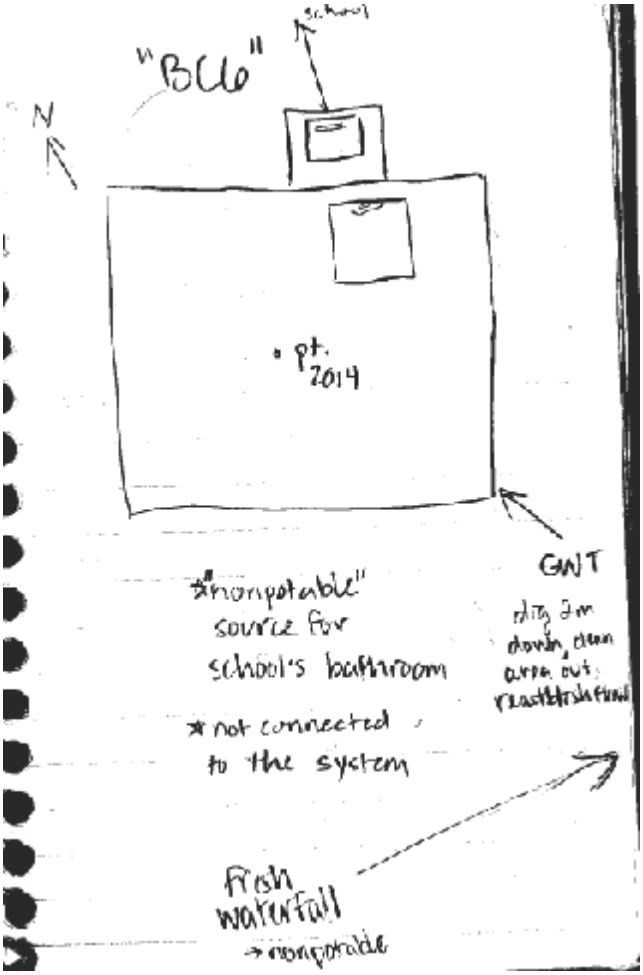

Figure 51: Spring 4 (pt. BC6) field sketch and notes.

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F.9 – Other Useful Sketches

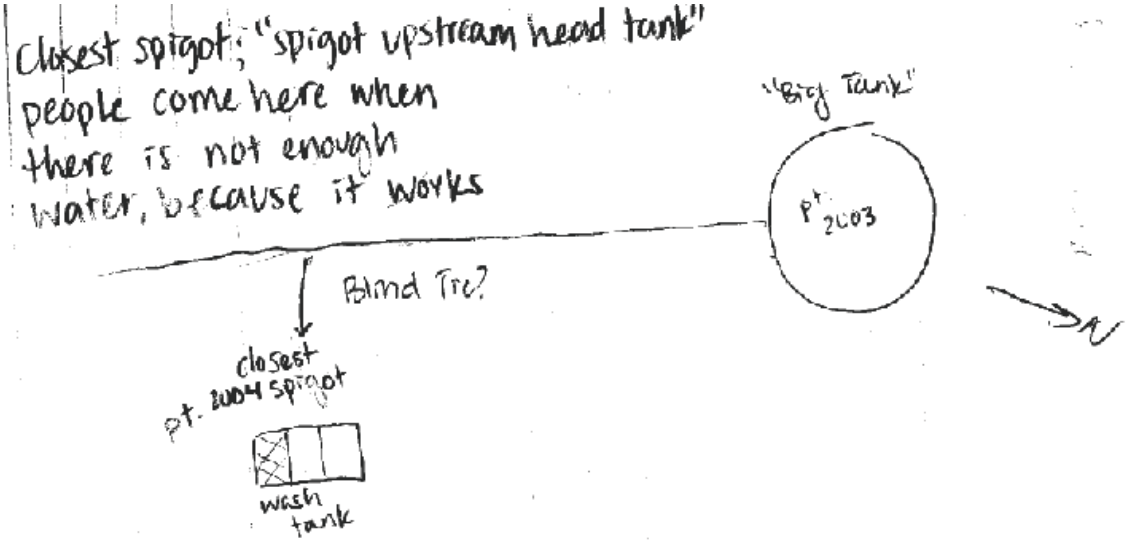

Figure 52: Spigot upstream of Big Tank field sketch.

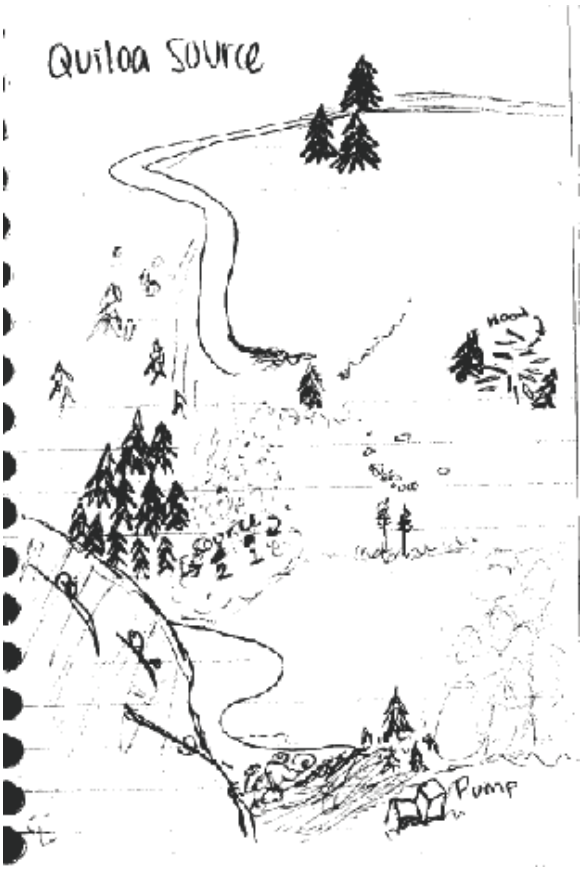

Figure 53: Alternate source Quiloa from vantage point field sketch.

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Attachment G – Additional Photos

Figure 54: School building.

Figure 55: Old nursery building used as the living quarters during the assessment trip.

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Figure 56: Community building

Figure 57: Typical terrain

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Figure 58: Vantage point above Comuna Guangaje

Figure 59: Typical roadways in Comuna Guangaje

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Figure 60: Typical buckets used for carrying water.

Figure 61: Example of household taking advantage of rain catchment

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Figure 62: Typical household in Comuna Guangaje.

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