

# Waterlines Trip Report: Panama 2010

## Trip Overview

The 2010 Waterlines trip visited numerous water projects in western Panama from January 4 to January 15. This year's visitors included Father Robert Cumberland from Arteaga, Coahuila, Mexico; John Vavruska, Waterlines volunteer from Santa Fe, New Mexico; and Paul Kennedy, environmental engineer from Souder, Miller and Associates in Santa Fe, New Mexico. Father Robert's sister Jeanette Hix of Houston, Texas also accompanied the inspection team. This was Father Robert's 20<sup>th</sup> trip to Panama for Waterlines and the first for the rest of the team.

Tim Wellman (Peace Corps APCD for Environmental Health Project) accompanied the team for visits to the joint Peace Corps/Waterlines projects at the beginning and end of the trip. Ryu Suzuki, the Waterlines-sponsored Peace Corps Volunteer completing his service in Panama, also accompanied the Waterlines group for several community visits. His research for the Masters International Program examines the condition of previously-constructed Waterlines projects, water committees and communities. Non-Peace Corps related Waterlines projects were visited during the middle portion of the trip in Coclé and Chiriquí provinces in southwestern Panama. The end of the trip involved a site visit in Bocas del Toro province on the Caribbean side of the Cordillera that runs the length of the country.

Approximately 20 communities were visited this year and the condition of the water systems ranged from non-functional to working smoothly. Several studies were assigned to Nicolas Arcia for potential future water projects. The Peace Corps continues to be a great and valuable partner in the implementation of Panama water projects. Based on the trip, a few observations and recommendations are provided at the end of this report.

## Community Water Supply Projects Visited

### Monday, January 4, 2010

Father Robert Cumberland, John Vavruska, Paul Kennedy, and Jeanette Hix (Father Robert's sister) all arrived Panama City around 7:30pm and were met by Tim Wellman, Peace Corps APCD for the Environmental Health Project. The team stayed at the Hotel California in Panama City.

### Tuesday, January 5, 2010

The team departed Panama City in a Peace Corps vehicle driven by Tim Wellman.

**Pedregoza (Coclé):** The team met Peace Corps Volunteer (PCV) Aaron Winston, who has been in the village for a couple of months. The spring box (more than 2 km above the village), the tank, and distribution system were completed recently by PCV Andrew Hable. A Waterlines completion report has been prepared and submitted. We visited the toma (spring box) which collects water from a gravel-filled water collection area through an array of six short lengths of ¾" pipe, penetrating the side of the spring box. The spring box was flushed and we measured a

flow rate of 2.25 GPM. The toma is in dense forest and well fenced off with barbed wire. Ryu Suzuki (the Peace Corps “circuit rider”), who accompanied the Waterlines team to the toma, gave the source high marks (5 on a 1-5 scale) for fencing, reliability, and cleanliness. Possible future additional work include a storage tank (location identified by community) and improving or enhancing the Air Release Valve (ARV) fittings on the network, as PCV Aaron commented that some are easily clogged with soil and there is currently no ARV at the toma.

The team stayed at the Pyramid Hotel in Santiago.

### **Wednesday January 6, 2010**

From Santiago, the team drove to Tolé to pick up Nicolas Arcia, who traveled with the team for the remainder of the trip. Ryu Suzuki also accompanied the team today.

**Quebrada Mina (Chiriquí):** The team met new PCV Kevin Orner who is living here. The system, completed by PCV Julie Herrick in June 2009, has two good tomas in two separate drainages which feed a common tank. Toma #1 needs a replacement of the screen to cover the cleanout pipe. The new collection tank (several photos) just above the village is in good shape. The brass clean-out and shutoff valves (photo) associated with the tank are partially buried and subject to corrosion, so it is recommended that valve boxes with lids be built to house the valves. During construction, a second linea madre, or distribution line, was connected to the cleanout pipe of the tank to serve a portion of the village, instead of fitting the tank outlet line with a tee. There are water quality issues associated with this arrangement: the tank cannot be flushed or cleaned except through the distribution system, and sediment will not settle out in the tank, but will be passed through the cleanout line to the users on that portion of the distribution system. The village conducted a lengthy committee meeting with words spoken by just about everyone attending. Paul Kennedy received a letter of solicitud from the community through PCV Kevin via email (attached).

**Calabasas (Chiriquí)(?):** This is an older system within walking distance of Quebrada Mina. The toma is in a forested ravine full of large boulders. The spring box is below the true water source just below the boulder area. It is recommended that a new spring box be located higher in the ravine to capture the true water source. The PVC pipe mainline is exposed above ground for a significant distance below the toma and, in places, is suspended by makeshift barbed wire supports. The pipe was breached in a couple of places with a short removable section of pipe inserted where water appears to be taken directly from the line, and damaged and replaced near the source due to previous flooding along the river.

**Oma (Comarca Ngöbe-Buglé):** Just before sundown, the team visited the new toma below the town of Oma in a forested ravine below the ridge crest where we parked the vehicle. This toma is used for the school aqueduct. A good job of harnessing the water source has been done here (photo). A washing station just below the toma has also been built. PCV Stephen Russo, who has completed his PC service and is no longer in Panama, previously provided a completion report.

The team drove on to the city of David and stayed at the Hotel Tolédo.

## **Thursday January 7, 2010**

Tim Wellman was dropped off at the David airport for his return to Panama City. The team then rented a 4WD Toyota Hilux pickup truck at the airport and drove back to Tolé for lunch at Nicolas' house.

**Nuevo Palomar (145):** This system was completed by Estévan Mendoza in May 2009. The reconstructed spring box appears to be in good shape, however, the area surrounding the toma needs to be fenced off. Also, Nicolas told the villagers that they need to stop cultivating yuca (cassava) and allowing other trees to grow around the source; roots can grow down into and interfere with the spring and toma, and there is damage to the plastic overflow pipe on the toma from fire. Flow rate from the toma appears adequate for the demand.

**Cerro Venado (21):** Marcial and Estévan Mendoza live here. The original solar pump was never installed by Victor as planned and the 6 solar collector panels are now in storage in the village. Marcial asked what we are going to do with them. The community may think that they own the panels – clarification is needed. In October 2009, the Panama government constructed a completely new system including a very large tank (approximately 9 ft x 9 ft x 5.5 ft high), a large pump house at the location of the former tank, and piping. Though new, this tank is leaking around the bottom and particularly around the clean-out pipe; the concrete blocks were laid on top of a concrete slab, partially explaining the leaks. A new electric pump has yet to be installed. Electricity from the grid will power the new pump. The pump will hopefully transfer water through the 2-inch PVC pipe up to a second tank approximately 150 ft of vertical elevation above the pump. This second tank is on top of a hill directly above Cerro Venado and is even larger (approximately 12 ft x 12 ft x 5 ft high). Unfortunately, most of the PVC pipe from the pump location to the upper tank is above ground, so UV damage over time is a concern. Waterlines paid in advance for the initial electrical hookup for the pump.

John, Paul, and Jeanette stayed at the Centro Misional Jesus Obrero in Tolé and Father Robert stayed at Nicolas' house nearby.

## **Friday January 8, 2010**

**Cerro Viejo ():** Water source is in a pasture and is unprotected from livestock. There is no spring box or other development of the source. This source supplies a single tank with water for an agricultural extension.

**Cerro Caballo (38):** A landslide, caused by construction of the road, covered the toma. The debris needs to be removed, but the source seems to be working OK. A flow of about 3 GPM was measured into the tank, though it was only about 20% full. High school students from David were staying in the village while working on a community service project and may have been consuming more than the usual amount of water.

The team then drove to Llano Ñopo, from which numerous water systems can be reached on foot.

**Quebrada Cama (143):** In the afternoon, the team visited the newly constructed system, overseen by Nicolas and completed in March 2009. The source consists of two infiltration ditches, each covered in gravel and capped with concrete. The two ditches join each other to form a common water source for the supply pipe. There is a clean-out at the bottom of each infiltration ditch. The entire toma area is fenced off with barbed wire. Overall, the source structure, tank, and piping look good. The source is only slightly above the tank.

### **Saturday January 9, 2010**

**Cerro Grande (133):** This first morning in Llano Ñopo, the team walked up hill to the fenced off new tank (8 ft x 8 ft x 6 ft high) constructed by Nicolas. Nicolas applied a plaster called “Cementa Sika” on the inside walls of the tank (photo), a watered down mix of cement and Sika (a cement bonding additive, actually the company name is Sika, a manufacturer of many cement-related products). The toma (photo), completed in June 2009, is not yet fenced in; the measured flow rate out of the toma is 6 GPM. There are seven crossings across ravines between the toma and the tank. Nicolas uses a PVC pipe within a pipe for the suspension crossings to protect the inner pipe carrying water from ultraviolet light.

**Llano Ñopo (26):** The team visited the toma for Llano Ñopo. It appears to be in good condition and receives regular maintenance. The community has high water consumption due to the large number of people living and visiting there. When school starts in March during the dry season, there is barely enough water. The sisters and the new water committee are working well.

**Alto Cienega (36):** The team visited the tank built in 1995. It is showing much wear and is possibly leaking, though no leaks are visible. The inlet flow into the tank was measured as about 3 GPM. The tank is about 8 ft x 8 ft x 5 ft high. The toma was completed on June 23, 2006 by Marcial. Nicolas thinks there are plant roots that are causing the spring to leak around the toma. The flow leaving the toma was measured as 12.7 GPM, so the loss between the toma and the tank is  $12.7 - 3 = 9.7$  GPM! The handle of the valve on the supply line at the outlet of the toma has free travel, so it is possible that the valve is frozen only partially open. After cleaning out the toma, the flow rate was 8.8 GPM.

Note, a villager named Victoriano Salinas would like a small water system for a single house near Alto Cienega. Nicolas can advise how to build a new toma above the house.

**Llano Bajamagua (?):** This consists of a single line from a source to a house plus a higher source under construction. This main higher source has been scraped out down to the bed rock (photos). From a visual estimate, the flow is about 3 GPM.

**Palomar (?):** This community lies along the river and on the trail back to Llano Ñopo. Tie-in of the pipe line from a higher water source is in progress. The new water source is located at the opposite end of the distribution system, so when the switchover of the tomas occur, the dynamics of the system may change slightly and require additional attention.

## Sunday January 10, 2010

**Llano Ñopo clinic – solar electric system (35):** The solar photovoltaic collectors, batteries, and controls on the clinic were all inspected. The collectors were cleaned with water. The collectors and controls were found to be in good condition, however, according to Victor, all of the batteries need to be replaced in the Hogar (expired) and the Woman`s Center (damaged). Father Robert will talk to the donors Awanda and Charles after Victor provides him with a cost estimate. Victor said that the 6 solar collectors that had been installed at Cerro Venado could be used at Llano Ñopo on the existing array.

**Buena Vista (135):** The village has a new toma and tank completed by Nicolas in December 2009. The toma has two spring boxes (photo) and was formerly a swampy area. The clean-out has very clear water. Flow rates measured were about 1 GPM for each spring box. Both the toma and the tank look very good. The community is very happy to have clean water delivered by the system.

**Alto Algarrabo (132):** Returning from Llano Ñopo, the team stopped here briefly in this village along the road atop a ridge. A study was completed, but the water committee has not yet organized. The Sisters will help with organization of the committee.

After stopping off at Nicolas' house, the team drove to David and again stayed the night at the Hotel Tolédo.

## Monday January 11, 2010

Jeanette was dropped at the David airport for her flight back to Panama City and home. The rest of the team returned to the region around Tolé to visit more communities.

**Llano Macano (33):** This community consists of 25 houses and a school. A water system was built about 12 years ago, but was never finished. The pipe apparently burst between the toma and the tank. The cause is unknown but exposure to the sun could be a factor along with residual head exceeding the pressure rating of the pipe. Downstream of the tank, the pipe is not buried and is exposed to the sun. This community shares its water source with another community – Changoso but we understand that the two communities do not cooperate on the water source.

**Changoso (91):** This community has a system that was built 4 years ago, but here too, the PVC pipe was not buried and damage by exposure to the sun is likely. The team hiked around the village through several ravines investigating potential new water sources for Changoso with its 15 houses. A suitable site for a toma was found close to the community but 3 or 4 of the houses would not be supplied by this toma. Nicolas will do a study in 2010 for a total reconstruction.

**Cogle (43):** The village of Cogle experienced a brush fire that burned a substantial amount of PVC pipe. To be damaged, the pipe must not have been buried. Cogle has provided a letter of request for 50 pieces of 2-inch PVC pipe to replace the damaged pipe.

The team drove to David and again stayed the night at the Hotel Tolédo.

## **Tuesday January 12, 2010**

The rental vehicle was returned to Avis and Tim Wellman was picked up at the airport. This final leg of the trip was advertised by Tim Wellman as the “Rugged Adventure”; we were not disappointed! The day was spent in reaching the village of Kwite on the Rio Manantí in Bocas del Toro. The PC vehicle with Tim Wellman, Father Robert Cumberland, John Vavruska, and Paul Kennedy was driven to the town of Chiriquí Grande on the large bay open to the Caribbean called Laguna de Chiriquí. From here, a dugout (cayuco) with outboard motor was taken across the bay and up the swollen Rio Manantí to village of Kwite where PCVs Jon Kittle and Austin Quig-Hartman met us.

## **Wednesday January 13, 2010**

The team along with PCVs Jon and Austin walked upstream for about 1 ½ hours along the Rio Manantí to the village of Calante where a Waterlines/Peace Corps Partnership Project system has been built.

**Calante (not yet numbered):** This is a large system: 65 houses, 60 taps, and a school with 300 students. Project construction was begun by PCVs Alicia Ashby and Matthew Rogge and completed by PCV Andrea Martenson. Current PCV Austin Quig-Hartman lives in the community and is maintaining and planning some upgrades to the system including possibly a new toma, valve protection boxes for the tank, painting the exposed PVC pipe on suspension crossings, and burying pipe (where possible) that is exposed in some places. The intake (photos) is in a steep forested watershed that collects water from a surfacing stream that flows possibly underground under large boulders. The intake is a slotted PVC pipe (2 ½”?) to strain out coarse silt that is inserted in the open catch basin. PCV Austin plans to investigate if a more suitable spring source can be located upstream. The intake currently has no fence protection though the villagers say there are no livestock this far up in the watershed. The tank (photo) is large (12 ft x 10 ft x 8 ft high) with an internal concrete wall baffle to isolate two compartments each with inlet and outlet piping so that if maintenance is needed in one compartment, the other remains operable.

## **Thursday January 14, 2010**

The team spent the day returning to Panama City, first via dugout to Chiriquí Grande, then by PC vehicle to Panama City.

## **Friday January 15, 2010**

Father Robert, John, and Paul returned home, flying out of Panama City on morning flights.

## **Project Studies to be Conducted in 2010**

The following are proposed project studies for Nicolas for 2010:

- Inquire about Quebrada Caña for an application (a letter was sent in 2009)
- La Huaca (140) (also referred to as Cerro Caña and incorrectly referred to as Quebrada Caña)
- Trinchera (144)
- Changoso (91)
- Alto Cienega (36) – tank needs repair, June/July 2010
- Alto Grillo (134)
- Bajo Guayabal (139)
- Llano Majagua (37) – February 15, 2010 Completion
- Cana Blanca (138) – new toma rebuild anticipated for March 25, 2010 completion
- Bajo Nube (116) – will be a long project, approximately May 20, 2010 completion

## **Observations and Recommendations**

Following are a few observations from the trip along with recommendations for consideration.

- Waterlines relies heavily on Nicolas Arcia who is a highly competent water supply technician, to study and execute water projects. Currently, without Nicolas, water project construction would be significantly impacted. Therefore, Waterlines should consider training additional people to be water supply technicians. Maybe Nicolas could recommend one or more apprentices that he could “take under his wing”.
- We saw several examples of poor workmanship and incomplete construction associated with projects conducted by Marcial and Estévan. In some cases, reconstruction will be required. It is recommended that Waterlines engage them less on projects.
- It is not clear how the non-Peace Corps systems are being designed from a hydraulic standpoint. If not currently being done, systems should be designed from survey data and using hydraulic calculations.
- We observed that in some projects, PVC pipe is lying on the ground or in unfilled trenches. Where possible, the pipe should be buried to protect it from sun exposure, animals, and erosion. The white PVC pipe will degrade and lose its pressure rating over time with cumulative sun exposure. It would be worth investigating whether more UV resistant plastic pipe (i.e. other PVC, high density polyethylene (HDPE), etc) is available in Panama. Also, in areas where sun exposure cannot be avoided the pipe should be painted, or in the case of suspension crossings, inserted inside another pipe for UV protection as has been done on some of the projects.
- The number of Waterlines projects in Panama has grown to the point where it is now difficult to oversee and monitor past and current projects using volunteer labor alone. Waterlines should consider options for how the organization can respond to the increased number of projects and maintain a constant connection with the communities. The possibility should be explored of having someone in Panama who would visit

communities, perform minor repairs, recommend major work, work with water committees, report to Waterlines, and collaborate with Peace Corps. A full-time “circuit rider” approach should be explored. This may also be a way to address concerns about the design of non-PC projects.

- A simple electronic database would be a helpful tool to track the status of the many Waterlines Panama water projects and would act as a repository of information about the projects. Once implemented, the database should be relatively easy to maintain and query for information.
- The grading criteria created and utilized by PCV/MI Student Ryu Suzuki may be a beneficial tool for future groups visiting and assessing Waterlines projects (i.e. what to look for when visiting a community or project). The grading scale (attached) may also be utilized as part of the database tool, to classify the overall status of projects and investigate which components of Waterlines' projects are successful or possibly require more attention.







