Water Distribution Systems Design for Northern Vallecito, Panama

**Project Overview**

Agua de Abajo Engineering traveled to Vallecito, Panama (shown in Figure 1) in August 2013 to collect data for the design of a water distribution system. A system was designed to provide all interested households with a reliable supply of potable water. Design challenges included pressure problems due to mountainous topography, the need to cross a river, and financial constraints.

**Community Background**

- Village settled about 70 years ago, school established 65 years ago
- Latino, Spanish-Speaking
- Approximately 70 households (300 people)
- Economy based on agriculture (products include coffee, bananas, chicken, oranges, beef, rice, etc.) and nearby construction projects

**Data Collection**

- Abney Level Surveying: Obtained elevation profile of systems in order to determine feasibility of gravity-fed system (see Figures 3 and 5 for elevation data)
- GPS X, Y Coordinates: Produced maps of water distribution routes in community
- Flow Rate Measurements: Obtained for two springs: Toma 1 and Toma 2 supply 25,000 and 72,000 L/d, respectively
- 3M Petrifilm Water Quality Testing: Significant microbial contamination present—a chlorination system is recommended (see Figure 7)

**Project Goal**

Design a gravity fed water distribution system and possible alternatives to provide potable water for 41 people (15% of the community) with 30 gallons/person/day.

**Proposed Design**

The final proposed design includes two separate gravity fed water distribution systems that serve 10 homes in Northern Vallecito. These two designs utilize separate spring sources, called Toma 1 and Toma 2 (shown in Figure 2). Construction will take two months.

**Toma 1 Design**

The first 7 houses in Northern Vallecito are served by Toma 1. The system is made of 2 inch diameter PVC pipe and ½ and 1 inch diameter PVC pipe at the tees. The design components and elevation profile are summarized below.

**Toma 1 Design Components continued**

- Pressure Reducing Valves: One valve on first tee to reduce high pressure at tap
- Air Release Valves: Implemented at every high point to reduce air blockages
- Tap Stands: Constructed at every house (see Figure 9)

**Toma 2 Design**

Due to elevation problems, the most sustainable option to provide water to the last three houses in Northern Vallecito is to utilize Toma 2 and provide one communal tap stand. The system is made of 1 inch diameter PVC pipe. The elevation profile and tap stand are illustrated in Figures 8 and 9.

**Conclusion**

- Developed an affordable and sustainable gravity fed water distribution system for community
- Designed to be durable yet easy to maintain with unique components to meet the needs of the community
- Next steps include obtaining Peace Corps approval and fundraising

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**Design Components**

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<thead>
<tr>
<th>Component</th>
<th>Toma 1 Cost</th>
<th>Toma 2 Cost</th>
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<tbody>
<tr>
<td>Pipeline</td>
<td>$4,400</td>
<td>$100</td>
</tr>
<tr>
<td>Spring Box</td>
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<td>Storage Tank</td>
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<td>$100</td>
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<tr>
<td>Valves</td>
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<tr>
<td>Tapstands</td>
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<tr>
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