

Steadfast Village

- The villages of Steadfast and Alta Vista lie several miles inland from the larger city of Dangriga, Belize.
- Because of this distance they are not connected to any municipal water source.
- The people living in the small villages cannot and do not want to pay for an expensive water purification facility. For this reason, they get their water straight from Billy Barquedier Creek only using pipes to route it into their homes.
- Every year during the rainy season, the creek swells and mud and debris clogs the villages' pipes and the water temporarily becomes undrinkable.
- In 2009 an engineering team from the U of A built a low budget gravity filtration system with the goal of filtering mud and debris to keep the water usable. Some parts of the system struggled to work and the flow capacity of the system was insufficient. The system remains, but has not been used in several years.
- By making modifications to the system currently in place, we hope to restore the use of this very sustainable water system.

Renovating the Water System

The project plan was to use the system currently in place but to refit it to use eight sand filter tanks all in parallel. This should help the system to run better as well as double its max flow capacity. To do this, the following steps were taken:

- Remove gravel from the four gravel tanks
- Construct and install filter cloth covered slotted PVC frames in the four empty tanks
- Refill the four tanks with a small layer of gravel and a large layer of sand
- Add a new length of pipe from A to B (Figure 1) to allow all the tanks to run in parallel
- Switch existing valves for the new flow direction
- Run water through the system both backwards and forwards to clean and settle the substrate
- Take water samples from the creek and filter outlet for microbe testing

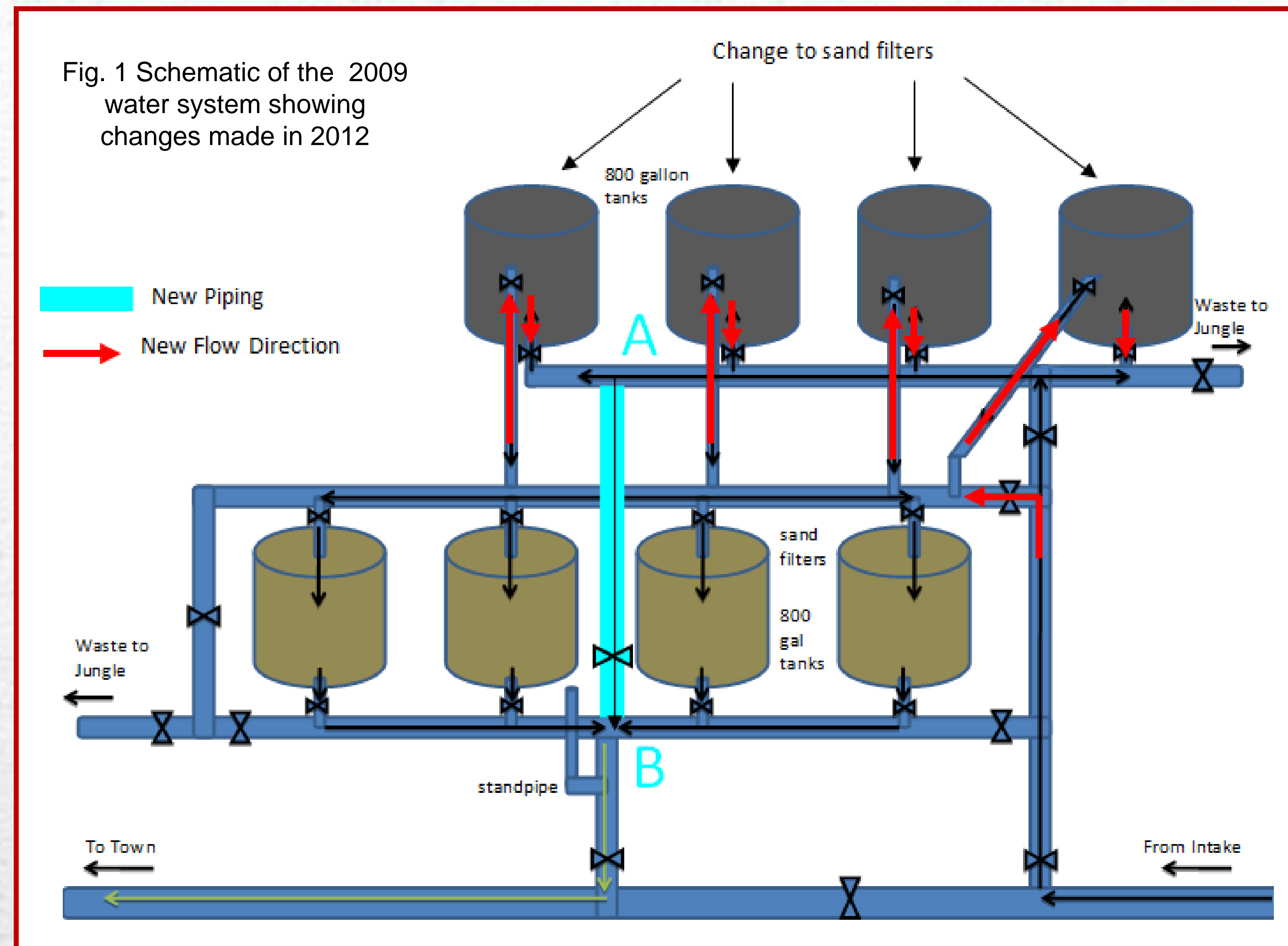


Fig. 2 Newly installed PVC filter



Fig. 3 Sand Tanks

Outcome of the Project

- All of the planned steps were carried out and the system was successfully renovated
- Members of the Steadfast Water Board were shown how to operate and clean the system so it could be switched on when it next rained
- Test results show that the filters do not remove many bacteria. But, they do successfully remove most mud and large debris and therefore they will still be a large improvements in the villages' water supply.

SUSTAINABILITY

Social System

- The residents of Steadfast and Alta Vista have accepted a continued slight risk of illness over incurring large water purification expenses and reduced water.
- The water system we put into place allows for access to drinkable water even during the rainy season which is a large improvement.

Built System

- The U of A water system is a built system that is completely green and sustainable.
- It is powered only by gravity and there are no inputs or outputs other than water.
- It is very low maintenance only requiring that it be back flushed and debris be removed after a period of use.

Natural System

- The filter system helps clean the villages' water with no adverse environmental effects.
- The filter is used in place of a more advanced filtration system, this in turn means that Billy Barquedier National Park will remain a protected natural area to maintain the water quality in Billy Barquedier Creek.

Reflection and Future Work

The project was completed according to what was planned and was considered to be successful. It was a good experience for all the students whom were involved as everyone learned a lot and had fun.

There is, however, still work that could be done and improvements which could be made:

- More and/or finer sand could be added to the tanks to improve filtration
- Testing could be performed to find an optimum balance between amount of sand and flow rate
- A better method for securing the tank lids while allowing them to be easily opened for cleaning
- The system intake's design could be improved to not become blocked as easily

Acknowledgements

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- The project was carried out by the University of Arkansas Engineering team led by Russell Bair and Colby Reavis
- The Steadfast Village Water Board suggested the project and provided the sand for the filters as well as workers to carry the sand to the project site
- Mr. Tony Pryor represented the Water Board, worked with the team, and provided valuable assistance in several steps of the project