

Introduction

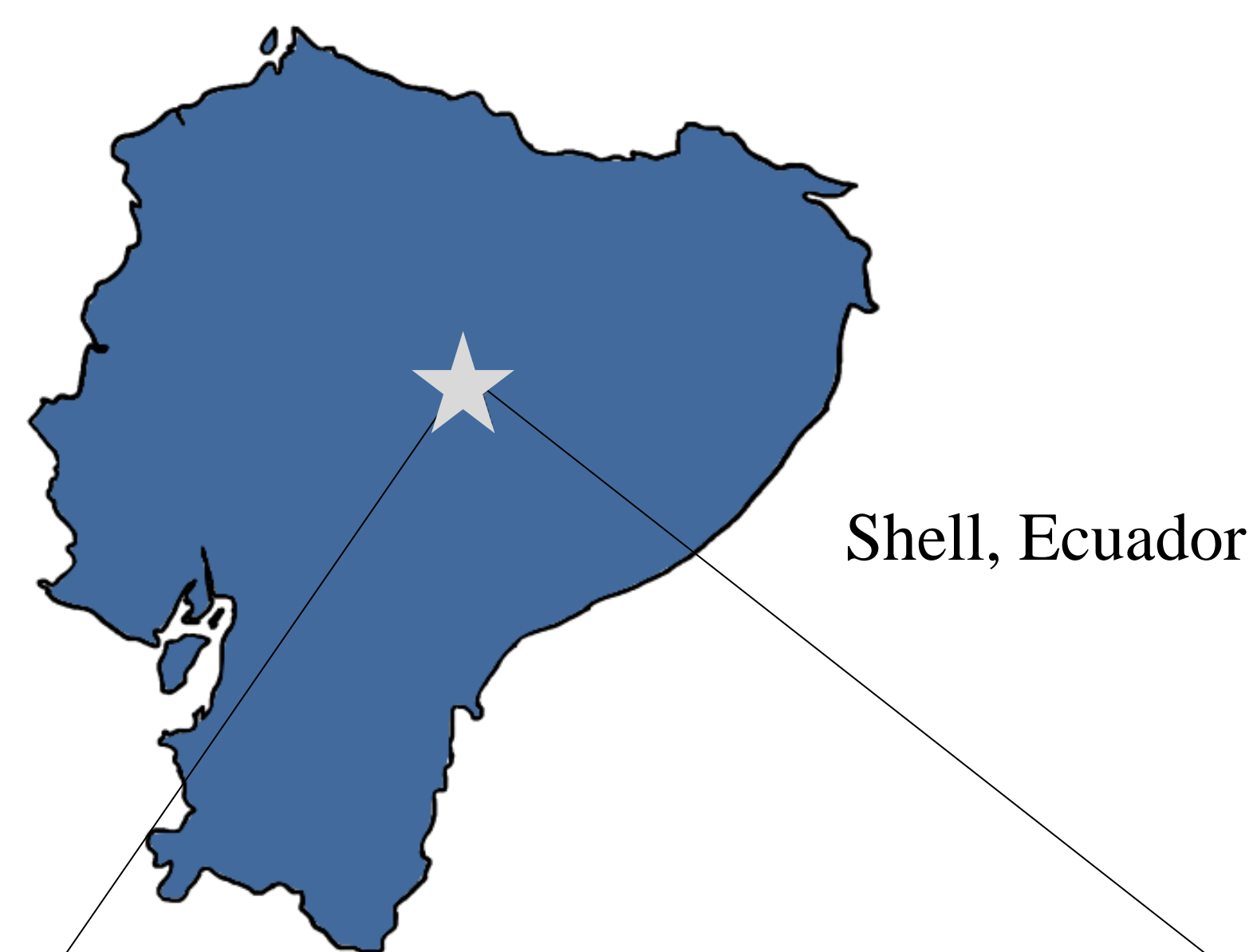
Chet and Katie Williams have been missionaries in Ecuador for 18 years. The Williams operate a mission house that teaches transitional life skills to the surrounding Waodani people while fostering conversations about the gospel.

Currently, the Williams spend around \$90 per month purchasing bottled water to provide safe drinking water to their family and guests.



The Williams family. From left to right: Tanner, Katie, Chet, Brooklin, Skylar

Project Location



Shell, Ecuador



Water Treatment

Filtration

Three Sawyer MINI Water Filters will be implemented in the water treatment design to provide in-line filtration.

- Inexpensive
- 7-log removal of bacteria and 6-log removal of protozoa
- Small enough to fit in carry-on luggage

Disinfection

The Clorid L-30 System will produce chlorine solution for disinfection through electrolysis.

- Low operating costs
- Manufactured in Cuenca, Ecuador
- Excess chlorine can be used as a household cleaner around the property



Sawyer MINI Filter

Clorid L-30 System

Structural Design

Loads

Two upper storage tanks and three lower storage tanks will be supported by a reinforced concrete structure. Each tank holds 290 gallons of water (1100 L).

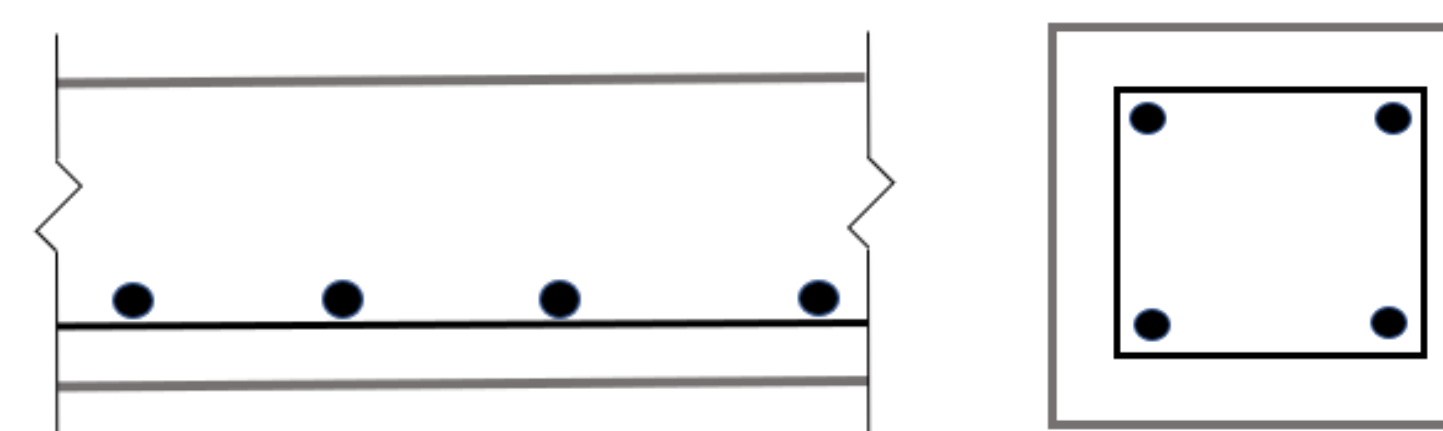
Material

Reinforced concrete was selected as the structure material for several reasons.

- Readily available in Ecuador
- Good workability
- Inexpensive
- Long-lasting; no risk of rust

Design

The structure will include 4 columns which will be 8"x8" wide with (4) #4 vertical bars and #3 lateral ties at 8" on center. The slab will be 6" deep with #4 bars at 12" on center longitudinally and #3 transverse bars at 12" on center.



Conceptual drawings of the slab reinforcement (left) and column reinforcement (right)



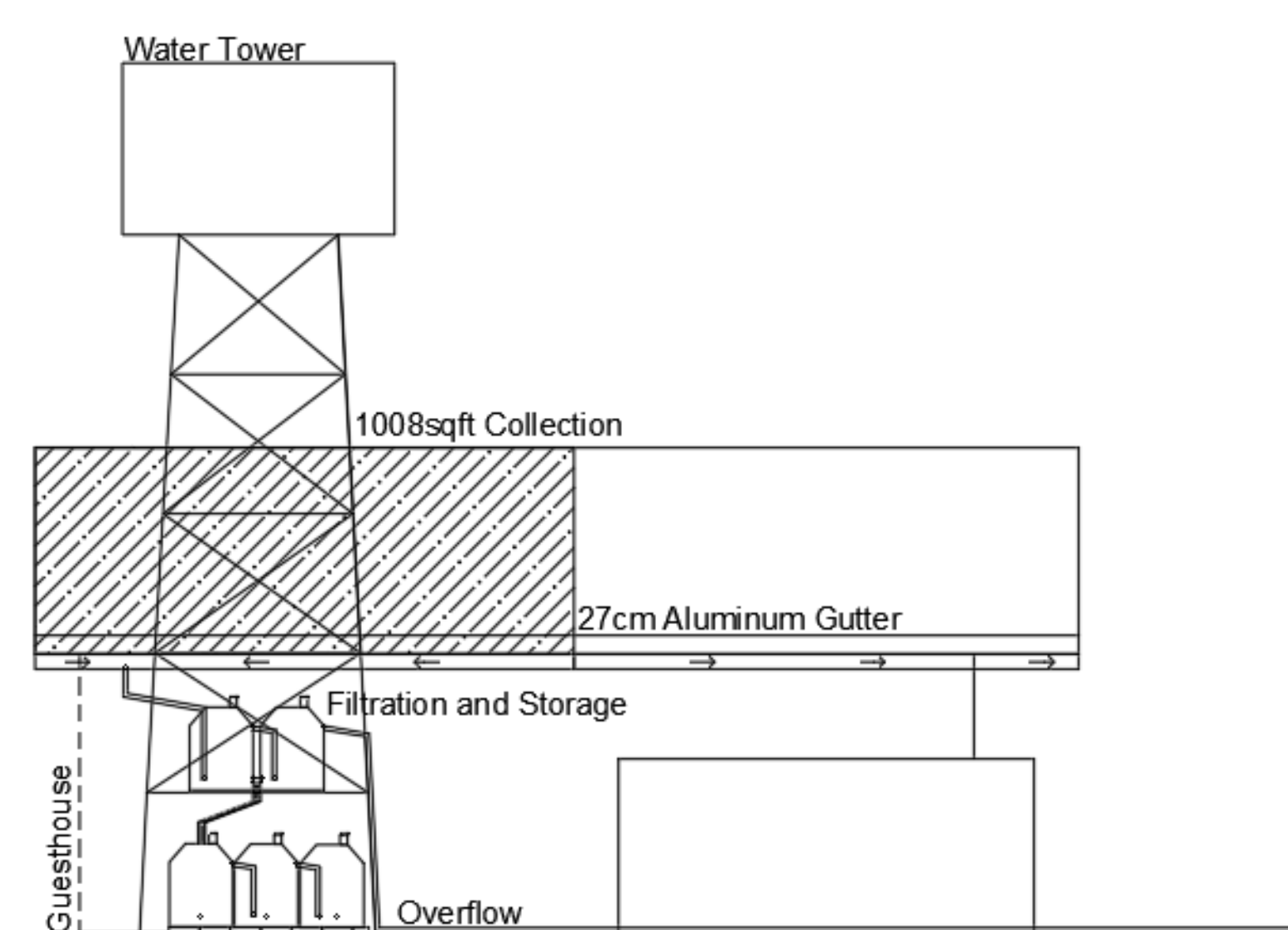
From left to right: Tyler Warners, Fiona Miller, Julia Balona, and Derek Ten Pas

Objectives

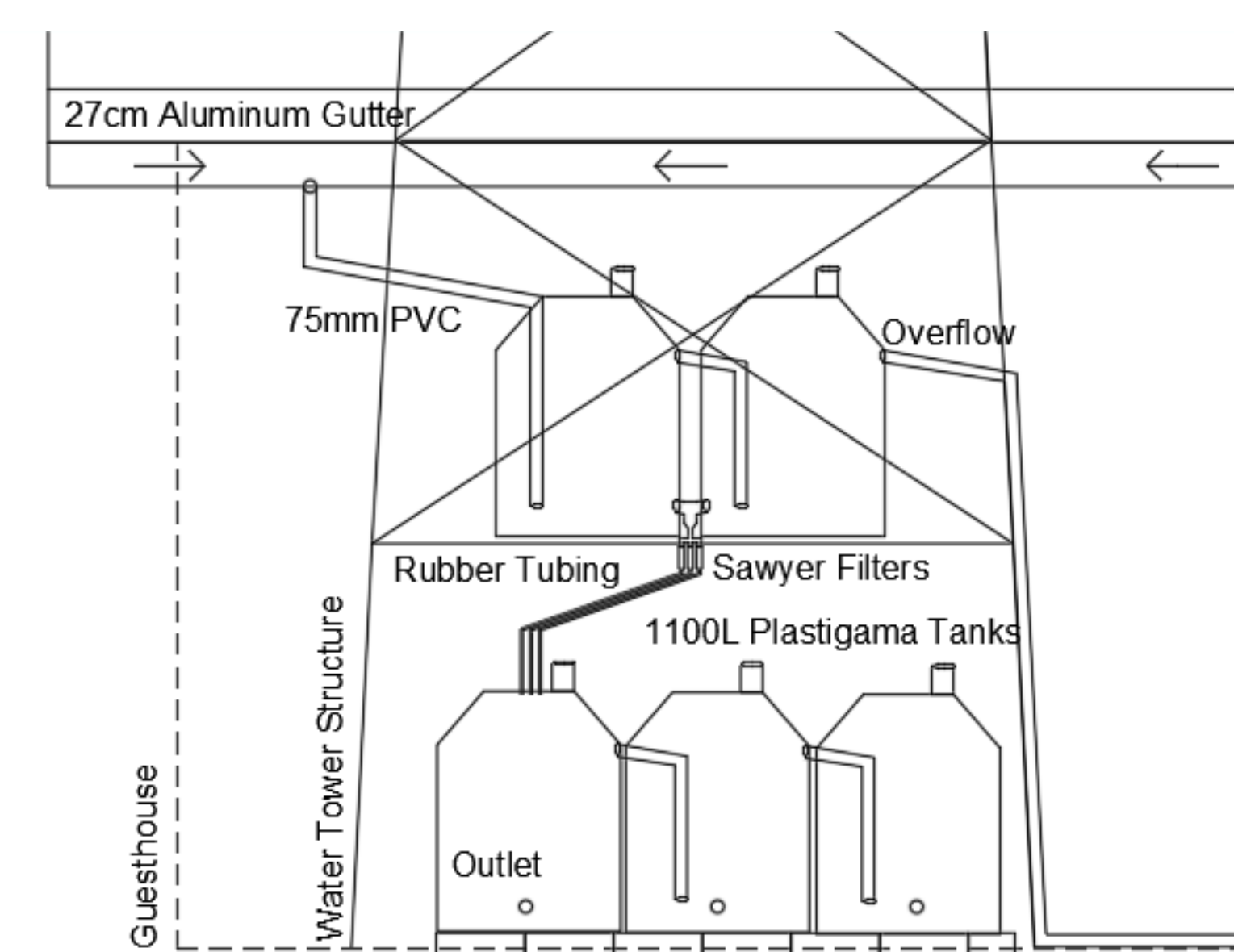
The primary goal of the team is to create a design with a delivered plan set for installation on the project site. The main objectives for this project are as follows:

- Provide water that is clean and safe to drink according to WHO standards
- Create a structural model of the existing water tower on the property
- Create a water demand study to determine pipe-sizing and water needs
- Design a cost-effective solution that can be maintained by a committed, nontechnical population

Overall Project Design



Overview of Project Design



Close-up of Treatment Design

Acknowledgements

Professor Leonard De Rooy, PE
 Professor Robert Hoeksema, PhD
 Professor Julie Wildschut, PE
 Professor David Wunder, PhD, PE
 Professor Chad Tatko, PhD
 Professor Douglas Vander Griend, PhD
 Chris Visscher, PE
 Bob Masselink, PE
 Sawyer Products
 Engineering Unlimited Student Organization