# Design Idea 2:

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**Design idea:** Install rain water collection systems to homes to allow the collection and filtration of uncontaminated water.

**Diagram of a diagram of water and purification

Description automatically generatedDesign Description:** This idea is designed to help the community of Yarrabah combat previous incidents of lead contamination in their water systems, causing massive health risks for the people living in the town. These lead contaminations were said to have originated from eroding pipes in the town’s filtration system. To combat this important issue, the instillation of a rain water collection system is being proposed. This system will be installed into homes in the town. It will use gutters on the roofs of the homes to collect rain water flowing down when it is raining. The water will then travel down the gutter, through a simple filtration system to stop any sediment or debris from entering, and into a large storage tank located on the property to store the unfiltered water before it is used. When there is a need for water in the home, the water will flow from the storage tank through a water filtration system designed to filter all the harmful substances from the water and make it safe to use.

## Design Approaches:

**Analyse:**

With the risk of faulty systems or devices and to assess the overall efficiency of the design idea it is important to analyse its effectiveness. By analysing the water before and after filtration we can prevent overlooking required maintenance and constantly check that the design is working as intended.

The technology used to analyse the water’s quality and condition is to use sensors and physical testing technology.

* One device that will be used is water purity testing kits that are operated by the people in the home and operate dipping a testing strip into the water and the strip with change colour based on the purity of the tested water. This colour will indicate if any common contaminants are present in the water making it unsafe to use.
* The other device that will be used is a water quality sensor. This sensor will be inserted into the water and have electrodes that interact with the elements in the water. The sensor monitors these reactions and communicates the data results by transmitting it to another device or software for the user to see.

Devices or tools required: water purity testing kits, water quality sensors.

**Eradicate:**

Eradication is a key component of this design to remove all harmful contaminants from the water system and make infected water clean and ready for use.

The technology used to eradicate contaminants in the water is filtration systems.

* The first device used to fulfil this purpose is activated carbon water filters. These filters use activated carbon or activated charcoal which are created materials that bind to certain impurities and toxins. These are very effective water filters because they attract and absorb these certain impurities and toxins, drawing them out of the water stream, while leaving the rest of the water to run freely past it.
* The second device used is an ultraviolet filtration system. This system works by using UV light to sterilize any bacteria or viruses in the water when it is absorbed into its DNA.

Devices or tools required: activated carbon filters, ultraviolet light filters.

**Prevent:**

It is also important to predict and prevent possible contamination as well to further increase safety and minimise risk.

The technology used to accomplish this is rain water collection and storage

* The first device that will be used is a gutter system. This system will be installed to the skirts of a roof and is designed to collect rain water when it has landed on the roof and flows down into it. This is because the town of Yarrabah has had bad issues with the community’s filtration system in the past contaminating the shared water system with lead affecting everyone there. By using rain water it makes the home less reliant on the shared water system and uses water that has been untouched by that filtration plant reducing the risk of the home being contaminated that way.
* The other device used is a water storage tank. The tank will be installed onto the homes property and will store the rain water on a separate system to the shared one, allowing the home to build a reserve of water that has not been affected by the filtration plant if a contamination breach is found. The water from the tank will then be filtered through the various filtration systems and into the home for consumption or use.

Devices or tools required: water gutters, water storage tank, water pipe and plumbing system.

# Benefits:

1. Relying less on the water system shared by the community as it has been unreliable in the past.
2. Collecting and using your own water as opposed to the communities shared water reduces the amount of water bills that the homeowner would have to pay.
3. The design is very future proof as long as it keeps raining.

**Impacts on the community:**

1. The design will upgrade the town’s infrastructure and provides a more modern solution to the problem.
2. The community will be paying less in the long term for water bills by collecting water themselves.
3. The rain water system provides a backup system for if the shared town system is down or has a contamination, the home will still have a way of getting some clean water into their home to use.

**Cultural appropriateness of the design:**

The design is not very culturally appropriate for the rural town of Yarrabah because it will be hard moving all the materials and equipment to the remote town for installation.

**Guiding principles:**

The design works with the guiding principles to provide:

* Sustainability – as long as it keeps raining there will be water for the collection system to collect.
* Health and safety – by using caught rain water the home is depending less on the unreliable shared water system of the community, reducing the risk of harm to occupants and protecting their health and safety.
* Access – by collecting water with the home it is providing easy access to clean water for the homes inhabitants.

# Constraints:

1. The first potential challenge implementing this design is the transport of equipment, materials and professionals to the remote town to install the infrastructure. Since the town is remote it might be difficult to transport everything there to get it installed.
2. The second potential challenge is the cost of the design. Upgrading a home with a water tank and new water system could prove costly to the members of the community who might not have a comfortable financial position.