**LAGI 2025 Fiji Aqualilly Narrative**

1. **Concept Narrative**

The Aqualilly design creates a space where the members of the community are able to come together to play, socialize, and celebrate. The goal of the design is to create a space for games, storytelling, educational activities, ceremonial activities such as the sacred Kava Ceremony, and whichever activities that the community may desire. The design offers something for every age group independently, as well as something for all groups collectively. This installation is meant not only for the members of the community, but visitors to the island as well.

Just as Fijians warmly welcome newcomers who show respect for their customs and way of life, the design of this space reflects that same spirit of hospitality. It invites visitors in, offering a sense of belonging, so long as they honor the cultural values and abide by community traditions. In doing so, both the design and the community foster an environment that is open, inclusive, and respectful, creating a shared space where residents, prospective members, and visitors alike feel genuinely welcome.

Surrounding the site are several local walking trails. One of which leads directly into the North side of the site. The area that it arrives at creates the opportunity for the occupant to approach the installation whichever way they may desire - whether that’s the North-East, North, or North-West path across the site. Whichever path they take, the occupant is able to explore the natural environment around them. Not only do they get to explore nature, but they get to discover all that the installation has to offer.

The Aqualilly, consists of four main components: solar panels, batteries, steel structure, and ferrocement cisterns. The solar panels are dually used as rainwater catchments, collecting both solar energy and rainwater to be stored in the ferrocement capsules below the walking deck. This design uses a series of low-maintenance systems to collect, filter, and store all of the water that falls on the solar panels, ensuring a cost-effective and simple solution to the water and energy scarcities of Marou. The Aqualily solely collects rainwater in order to prevent contaminating the collected water with pollutants found on ground surfaces such as garbage, fecal matter, fertilizers, and other chemicals. By reducing the chance of contaminants, we are providing even safer, cleaner water to the community of the Marou Village.

1. **Technical Narrative**

The Aqualilly is a modular solar-powered water and energy system designed to provide safe drinking water and reliable energy storage for the village of Marou. The system uses monocrystalline solar panels as both an energy source and a rainwater catchment surface. Each modular prototype unit has 147 sq ft of solar panels which produces approximately 15 kWh/day and helps capture rainwater for storage and treatment. These high-efficiency panels (20–22%) are well suited for Fiji’s tropical climate, offering durability, a 25+ year lifespan, and resistance to salt-air corrosion.

Collected rainwater first passes through a leaf screen and a first flush diverter that prevents debris and contaminants from entering the filtration system. Once flushed, water flows into a slow sand filter, housed within a 2.4-meter diameter hexagonal ferrocement module. This filter handles primary treatment at a flow rate of approximately 0.2–0.4 m³/m²/day, depending on sand depth and maintenance.

Post-sand filtration, water enters a closed pipe system where it undergoes further treatment through coconut-activated carbon filtration, which improves taste and removes additional organics, and a UV sterilization unit to eliminate pathogens. Treated water is stored in a cistern system made up of six interconnected pods totaling approximately 5,400 gallons (20.4 m³).

The system also includes battery storage beneath the walking surface for nighttime use or cloudy days. The Aqualilly prototype is designed to be scaled over time requiring only five additional prototype modules to meet the 75 kW generation goal for the village.

1. **Prototyping and Pilot Implementation Statement**

The Aqualilly prototype prioritizes low-skill construction and community-led expansion. It comprises seven modular ferrocement pods that form the base of the solar array and water filtration system. Ferrocement is ideal due to its durability, affordability, and ease of installation. With proper training, local workers in Marou can construct and replicate the modules without relying heavily on skilled labor.

Critical components like the slow sand filter can also be built and maintained by the community. Electrical systems such as solar panel arrays, inverters, battery storage, and the UV sterilizer will require skilled technicians for initial installation and periodic inspection, with knowledge transfer included as part of the implementation plan.

Each prototype module functions as a standalone unit, with integrated energy and water systems. Once the prototype is successfully installed and operating, the modular design allows for flexible scaling in any direction. To meet the 75 kW solar target, five additional modules (totaling 882 sq ft of panel surface) will be installed throughout the community. This phased strategy reduces up-front costs, eases logistical burdens, and supports long-term community involvement and ownership.

The ferrocement components are able to be erected and installed on-site following excavation for the cisterns. The base of the cistern will be placed approximately 9 feet underground in order to maintain a constant temperature for the water. The steel structural components that make up the water catchment and solar array will need to be pre-fabricated and brought to the island for assembly.

1. **Operations and Maintenance Statement**

The Aqualilly is designed to be low-maintenance and community-operated. Most upkeep tasks such as clearing leaf screens, rinsing catchment surfaces, and monitoring filter performance, can be carried out by trained local residents. The slow sand filter requires occasional raking or surface sand replacement, especially after extended dry periods.

The activated carbon filter will typically need annual replacement, which can be supported with locally sourced coconut shell media when possible. The charcoal needed for the activated carbon filter can be feasibly produced by burning the coconut shells in underground furnaces or kilns similar to local practices. The UV sterilizer and battery system will require occasional technical checks, and a plan will be in place for technician visits or remote diagnostics to minimize downtime.

The system can deliver water manually through a hand pump or with an electric pump powered by the integrated solar storage.The goal is to foster local autonomy in maintaining and expanding the Aqualilly network, with specialists brought in only as needed for higher-level system checks.

The design incorporates a series of discreet access panels along the walking surface, providing convenient maintenance access to key water filtration components and energy storage systems. Utilizing low-maintenance filtration technology, the system requires filter cleaning only every few months, and for some components, just once a year.

1. **Environmental Impact Assessment**

The design is thoughtfully integrated with the surrounding vegetation to minimize disruption to existing plant life and natural waterways. By building around the native landscape, the system helps preserve ecological balance while also protecting the underground ferrocement structures from potential erosion caused by root growth or water movement. This approach not only reduces environmental impact but also enhances the long-term durability and resilience of the installation.

To achieve this, a considerable amount of excavation is required in order to place the foundation deep enough to stabilize the cisterns in the case of a cyclone, and to keep the water stored in the cisterns at a consistent, cool temperature. The cisterns will be typically placed 9 feet underground. However, with the slope in the topography, the depth of the cisterns will realistically vary anywhere from 8 to 10 feet deep depending on the cistern. The removed earth will be repurposed for a series of berms that contribute to erosion control, water management and crop irrigation on the site. Additionally, if the soil composition is rich in clay, there is potential to use it for local pottery or brick-making, offering both cultural and economic opportunities for the community.

The design makes use of steel for the water piping and structural systems within the installation. While steel production is energy-intensive and contributes to global emissions, its durability, recyclability, and structural efficiency make it a responsible material when used properly. In our design, steel is used strategically for structural elements that convey collected rainwater and require strength, longevity, and resistance to corrosion in a tropical environment. Its high strength-to-weight ratio reduces the overall volume of material needed, and its long lifespan ensures minimal replacement or repair. Whenever possible, we will source steel with high recycled content and work with suppliers committed to low-carbon production methods. At the end of its use, the steel components are fully recyclable, supporting a circular material economy and minimizing long-term waste.

The use of ferrocement capsules in the Aqualilly system is a key aspect of its sustainability, both environmentally and socially. Ferrocement is a durable, low-cost material made from cement, sand, water, and layers of wire mesh, which makes it ideal for long-lasting infrastructure in remote or resource-limited areas. Its resilience to weather, corrosion, and seismic activity ensures a long service life with minimal maintenance, reducing the need for frequent replacement or repair. Furthermore, training local villagers to construct these capsules not only builds community skills and self-reliance but also eliminates the need for transporting heavy prefabricated materials, significantly cutting down on emissions and costs. By producing the infrastructure locally, the project supports the regional economy and fosters a deeper sense of ownership and stewardship, both of which are critical to the long-term success and sustainability of the system.