Desalination Plant Innovation and Improvements of Arecibo Tourism

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Introduction

The Desalination Plant Innovation and Improvements of Arecibo Tourism is an eco-friendly project at Arecibo, Puerto Rico developed by FAJJEX Engineering as part of the Civil and Environmental Engineering Department Course CE-4920 Civil Engineering Design Project II. The project consists of a water desalination plant, private villas, and a water park that will all work together to create an eco-friendly complex. The private villas and water desalination plant will be completely powered by solar energy. In addition to supplying both projects, the water desalination plant will supply 9 MGD to the "Super Acueducto" water distribution plant. This will benefit part of the north region of Puerto Rico especially in times of rationing of water caused by drought.

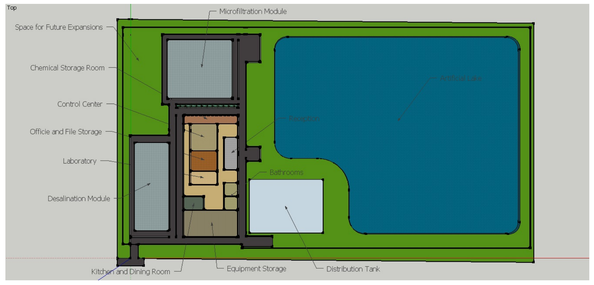
Location

Image 1: Project Area Designation

Arecibo, Puerto Rico (18° 28' 16.55" N , 66° 42' 26.65" W) Road 681 by the south and 680 by the west. The location is easily accessed by PR-2 and PR-22.

Conceptual Design

Water Desalination Plant:



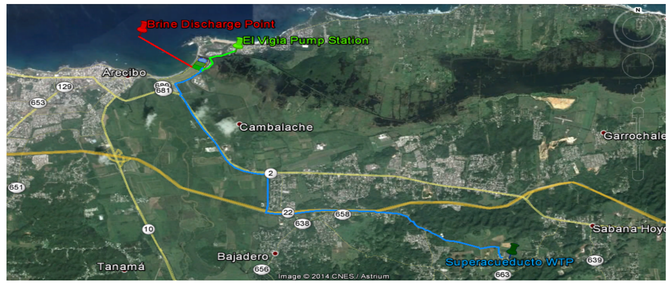
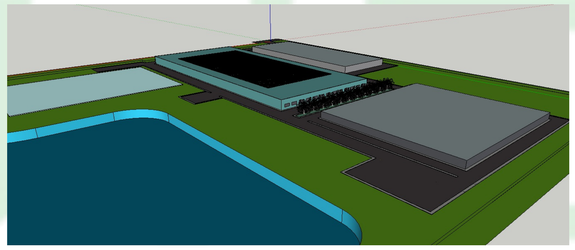


Image 2, 3 & 4: Water Desalination Plant Layout and Connections

The desalination plant consists primarily of three main components, a micro-filtration module (in case pre-treatment is needed), a distillation (Multi Stage Flash) module and a water distribution tank. The water intake will be provided by an artificial lake next to the plant containing around 67 millions of gallons and the discharge point will be 1.5km into the Atlantic Ocean. The main structure (450ft X 200ft) will be supported by a metal deck roof, steel joists, steel girders, and steel columns with tilt-up walls and lateral bracings. The roof will have a 3inch thick concrete topping which will be used to place 1615 solar panels to provide all the electricity needed for the plant to operate. This water desalination plant is a very eco-friendly plant because of the desalination of water and the usage of 100% renewable energy.



Empyreal Villas complex:

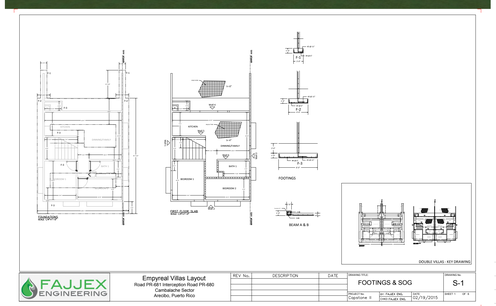


Image 4 & 5: Empyreal Villa Sketchup and Structural Plan

Our twenty-eight villas come fully equipped with solar panels for a 100% renewable energy source. This three bedroom and two bathroom villas are made from reinforced concrete.

Brine Splash Water Park:

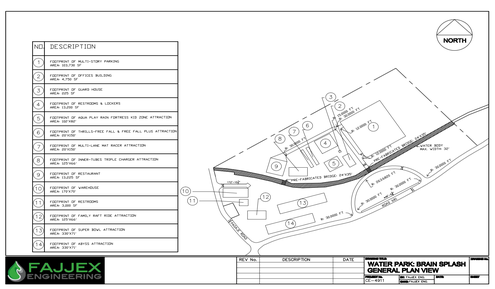
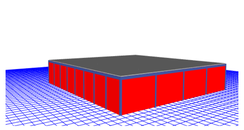


Image 6: Brine Splash Water Park Layout



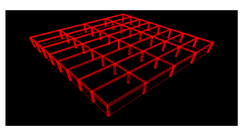


Image 7 & 8: Restaurant structural and frame render views on Etabs

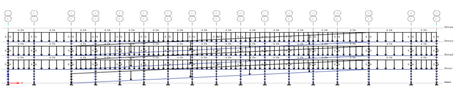


Image 9: Dead loads acting on parking structure.

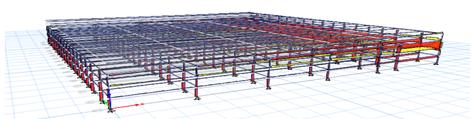


Image 11: Axial force diagram of parking structure.

Image 10: Brine Splash Water Park Attractions

The primary reason to visit a water park is to enjoy of a diversity of water attractions, so this one is composed of seven amazing water attractions, with facilities structures such as a multi-story parking, offices, restrooms, a restaurant and a warehouse.

Costs

Costs		
Project	Capital Costs	Operational Costs (Annual)
Desalination Plant	$110,753,760.43	$ 1,061,727.83
Villa Complex	$ 9,281,421.00	N/A
Water Park	$ 38,475,732.43	$ 1,835,942.60
Total	$158,510,913.90	$ 2,897,670.43

Table 1: Project Costs

Revenues		
Project	Total	Type
Desalination Plant	$ 15,138,272.17	Annual
Villa Complex	$ 9,800,000.00	One Time
Water Park	$ 10,268,307.00	Annual
Total	$ 35,206,579.17	First Year

Table 2: Revenues

Conclusion

- **An economically self-sustained business that will create job opportunities and improve the economic status of the municipality of Arecibo.**
- **An eco-friendly design in benefit of the community and the implementation of a family oriented environment.**
- **The implementation of a desalination water plant in Puerto Rico is a great leap in the distribution of water in the Island specially during periods of drought.**
- **The implementation of GREEN principles on the development of the Water Desalination Plant and Villas Complex will contribute to the awareness of the environmental impact.**
- **Improvement of the tourism in the municipality of Arecibo with the biggest water park in Puerto Rico.**

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