Outlining the Case for an Artificial Groundwater Recharge System

Jamaica Experience

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Presentation Plan

I. Introduction
II. Aquifer
III. Project Objective
IV. Design & Construction
V. Operations & Maintenance
VI. Conclusion

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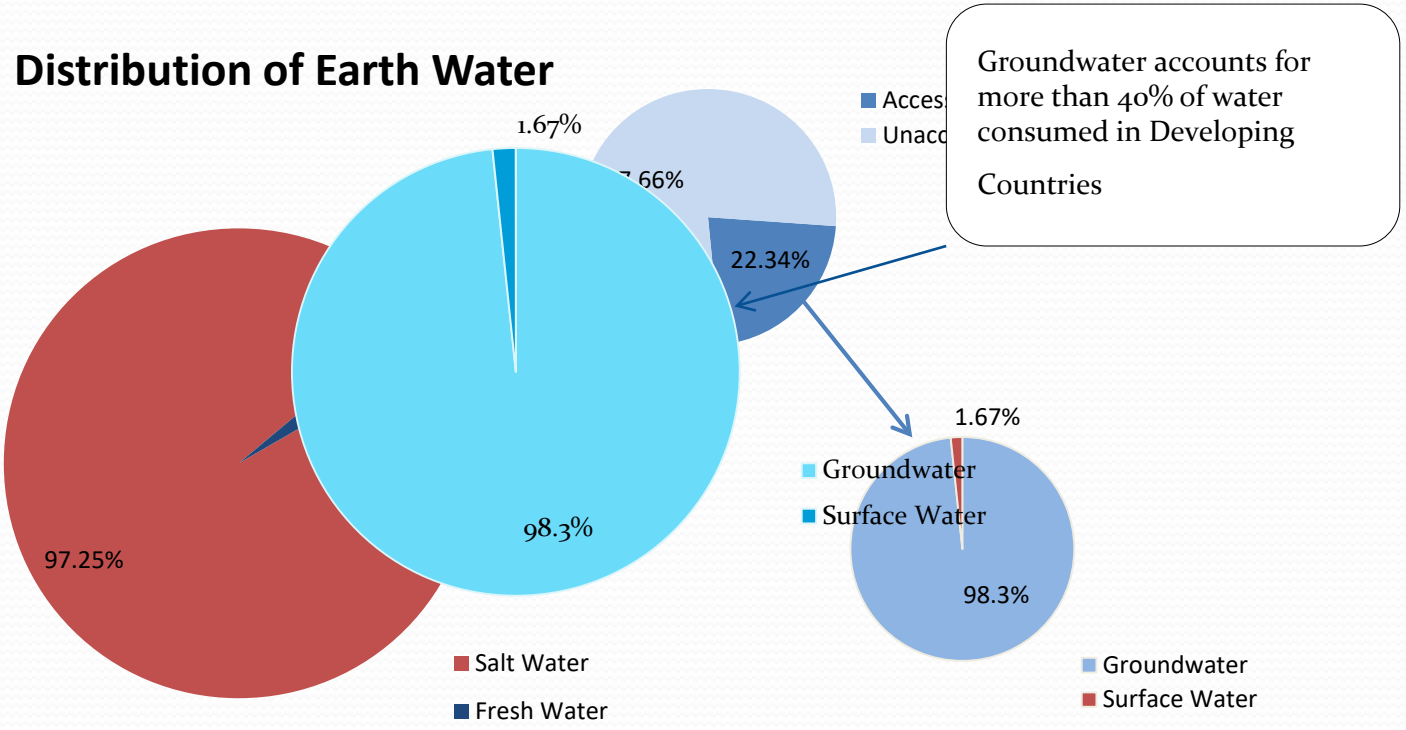
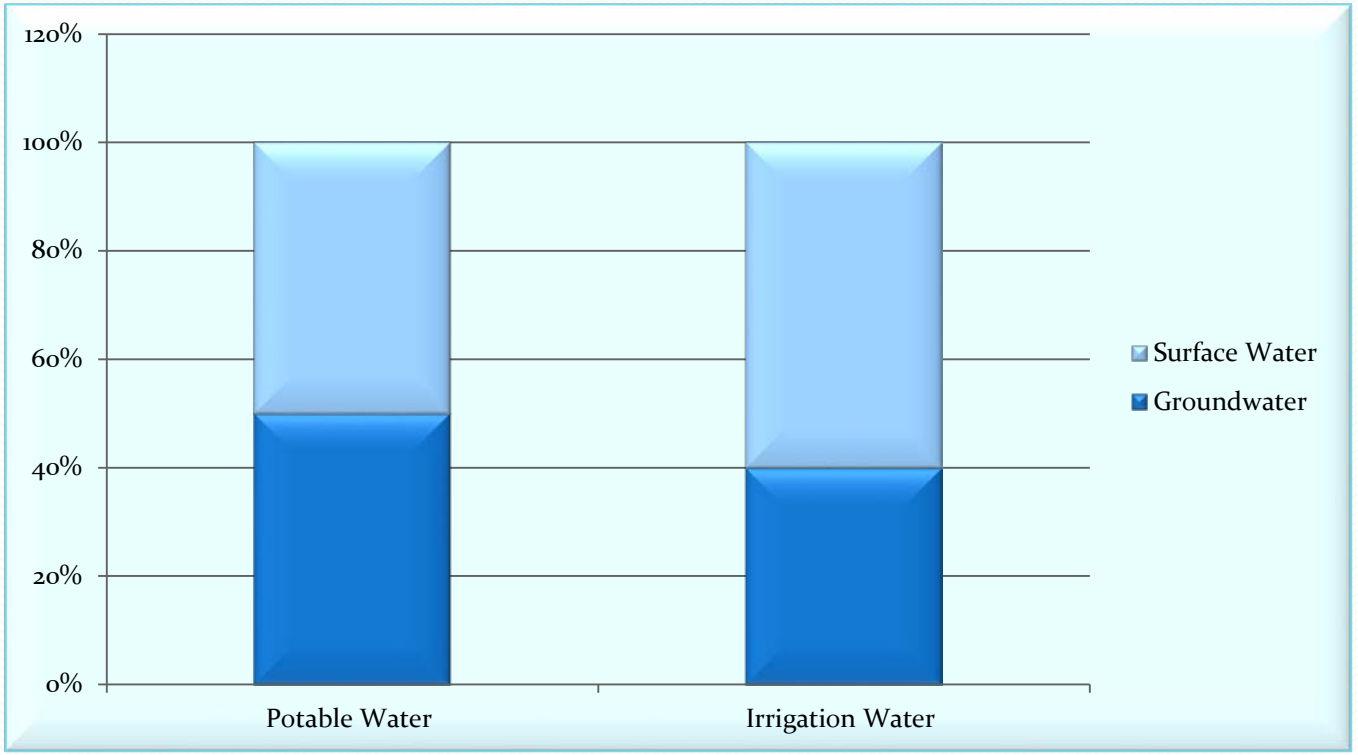
Introduction

Global Picture of Water Resources



Introduction

Jamaica Situation



Introduction

Threat to Groundwater Sustainability

- Urbanisation
  - Impermeable Surfaces
  - Pollution of Environment
- Climate Change
  - Rise in Global Temperatures
- Jamaica has experience severe drought
  - Groundwater resource in Jamaica reduce by some 5%
  - Jamaica's Annual Rainfall for 2015 has been the lowest for more than a decade

Introduction

Imperative that Mitigation Measure/Solutions be Implemented

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Government of Jamaica main objective – Make the country's Water Resources & Supply Systems more resilient & less susceptible to climate change & drought

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National Water Commission (public utility provider – Development of an Artificial Groundwater Recharge System

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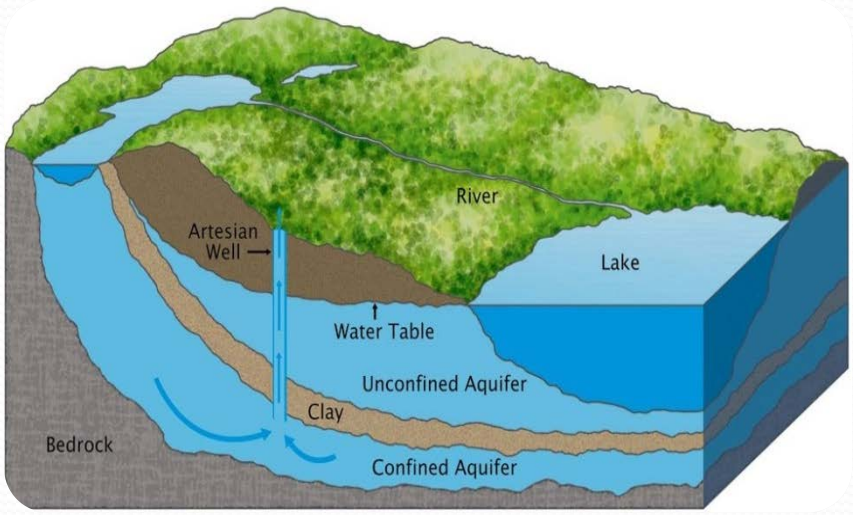
Aquifer

- An underground layer of permeable rock, sediment of soil that holds water
- Artificial Aquifer Recharge
  - Direct Surface Recharge
  - Direct Subsurface Recharge
  - Combination of the two
  - Indirect Recharge



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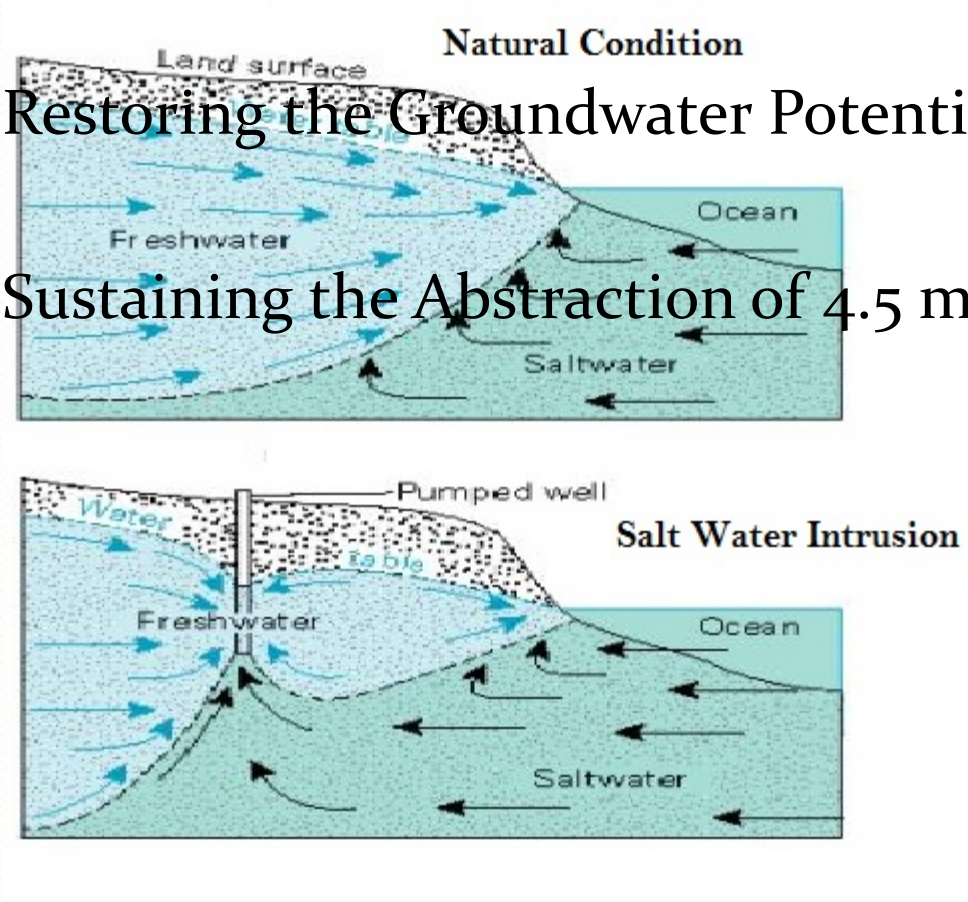
Project Objective

- Flushing back of saline intrusion
- Restoring the Groundwater Potential
- Sustaining the Abstraction of 4.5 migd



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Design & Construction

Design Considerations:

1. Identification of suitable aquifer & suitable water source
   - The aquifer was selected base on the need
     - Selection of Recharge Points – maximise recovery of water
   - Water source was selected on availability
   - Recharge rates
   - Abstraction rates
   - Available storage capacity in aquifer
   - Recovery of Recharged Water
   - Clogging of the Aquifer from Recharge
2. Assessment of selected aquifer & Water Resource Modelling
   - Potential Groundwater Impacts due to Recharge & Net Mound Elevation/Migration
3. Assessment of Source Water & Potential Risk
   - Water Rate
   - Contamination of existing Groundwater

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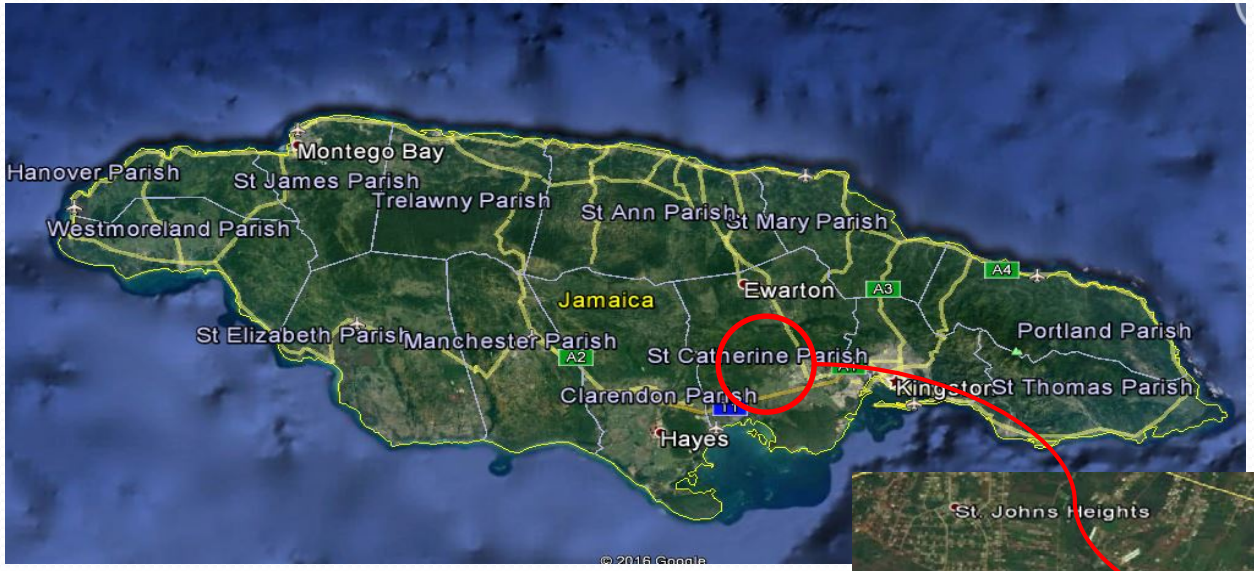
Design & Construction

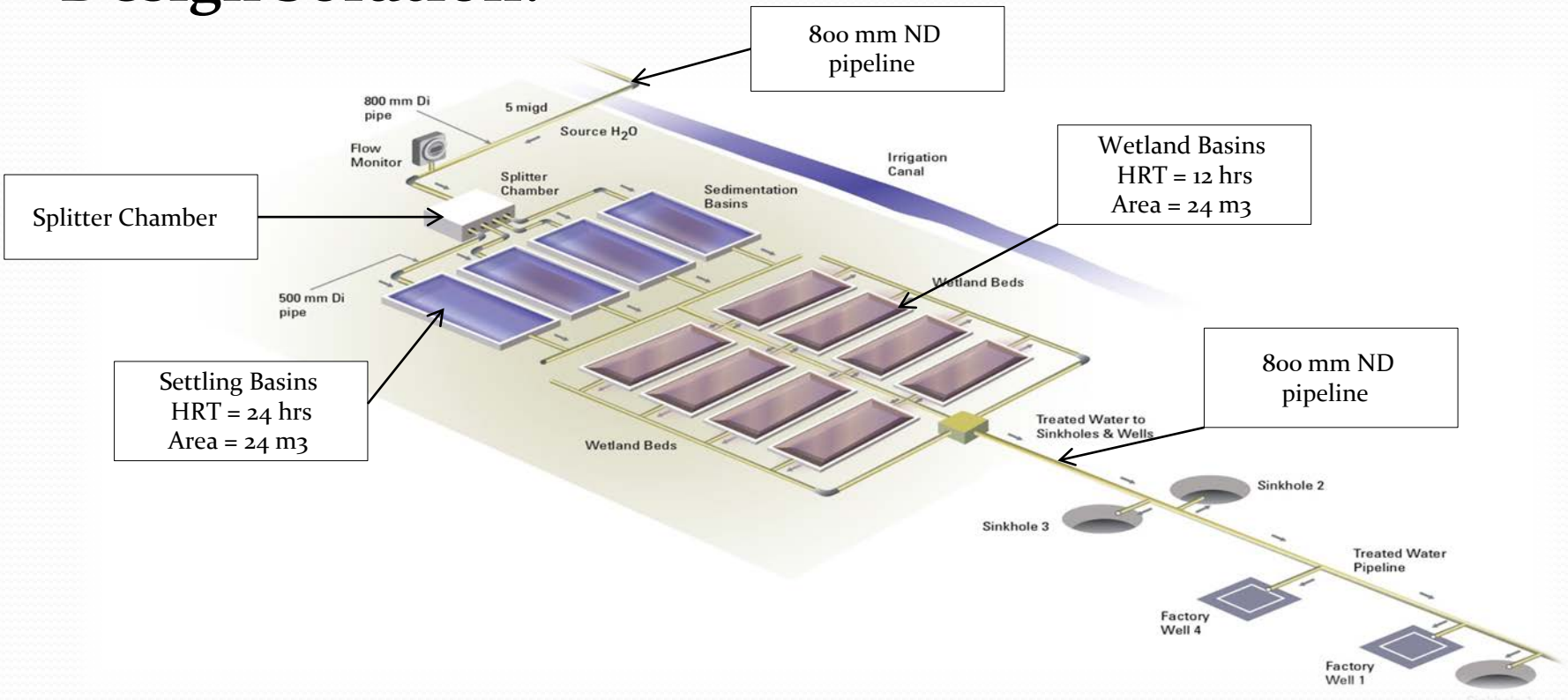
Project Location



58 Acres in Innswood, St. Catherine

Design & Construction

Design Solution:



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Operations & Maintenance

- Daily operation of the control structures & recording of flows
- Annual removal of sediments from the Settling Basins, or as needed.
- Annual control of invasive vegetation, or as needed
- Annual harvesting of Wetland Beds Reeds, or as needed
- Monitoring of performance of Aquifer through monitoring & sample collection & analysis

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Conclusion

- The Jamaica Artificial Groundwater Recharge System satisfies all the major purposes for developing a groundwater recharge system, such as:
  - Increasing the bank of useable groundwater for continued and improved abstraction
  - Increasing the buffer zone between freshwater/saltwater
  - Providing storage for unused surface water in a regime that minimizes the effects of evaporation
- Additionally, the Artificial Recharge System is unique in the following ways:
  - The ARGS utilizes the natural topography of the land to establish a fully gravity and energy-free system.
  - This system allows for direct discharge into aquifer by utilizing existing sinkholes and deep wells.
  - The treatment facility ensures that recharge water of equal or better quality enters the native aquifer water.
  - The system utilizes excess irrigation water that would otherwise flow directly to the sea, to replenish and augment the vast underground reservoir for future use.
- Finally
  - Artificial Recharge appears to be a more effective technology when compares to other surface water augment methods
  - Artificial Recharge can maintain groundwater levels in situations where natural recharge has become severely reduced.
  - Artificial Recharge can assist with water resource management that responds as a positive adaptation need to climate change

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Acknowledgement

NATIONAL WATER COMMISSION
Water is life

Design Phase

NIPPON KOEI

JICA

Operations Phase

WATER RESOURCES AUTHORITY

Construction Phase

IDB Inter-American Development Bank

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Thank you for your attention