

North Relief Canal Pilot Plant Project: Final Update Summary



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Project Basics

Four Stages:

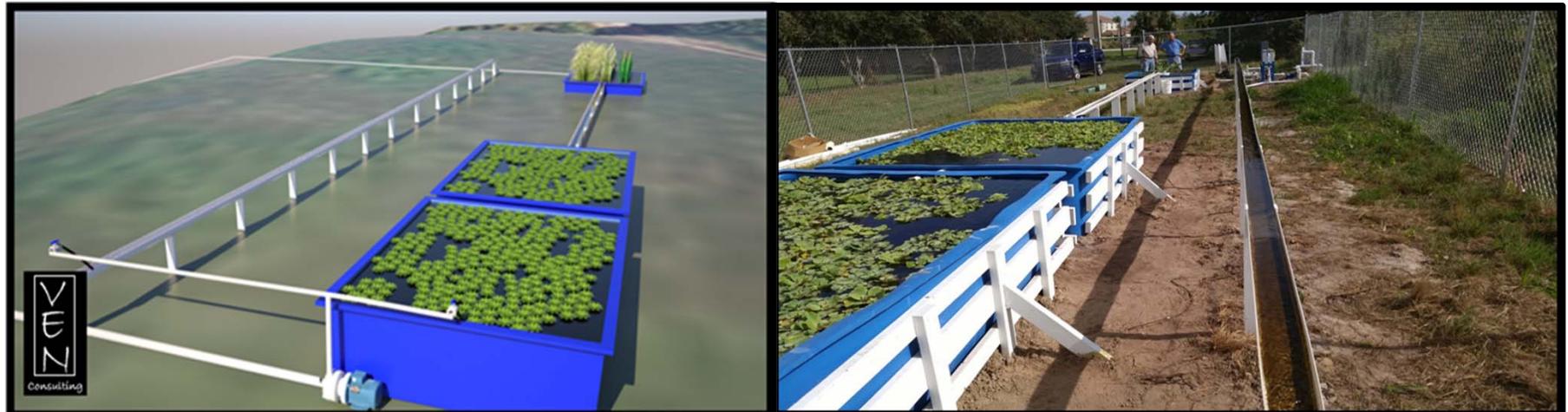
Stage 1: Site Selection, Preliminary Water Testing, and Pilot Plant Construction

Stage 2: Comparative Testing Systems

- Stand-alone Attached Algae System
- Low Energy Aquatic Plant System (LEAPS™): Water Lettuce, Algae Floway, and Emergent Aquatic Plants

Stage 3: Pilot Testing: Optimal Plants and Parameters

Stage 4: Preliminary Full Scale Design Report





Stage 1: Basic Water Quality Findings

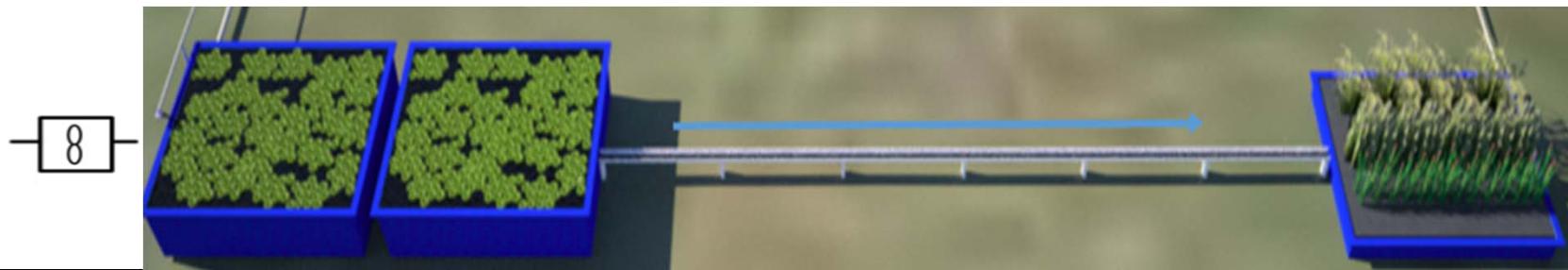
- Majority of Nitrogen is organic form = 78.1% (difficult for plants to utilize)
- Majority of Phosphorous is in Ortho-Phosphorus state = 70.9% (readily available to plants); nitrogen limiting conditions
- Nitrogen and Phosphorous levels seasonally variable
 - Average influent concentrations during pilot operational period was 0.77 mg/L nitrogen and 0.13 mg/L phosphorous; similar to Egret Marsh Facility (N=0.95 mg/L and P= 0.101 mg/L)
- Suspended solids are low, rarely above detection limits (< 15 mg/L when detected)



Stage 2 and Stage 3:High Level Findings

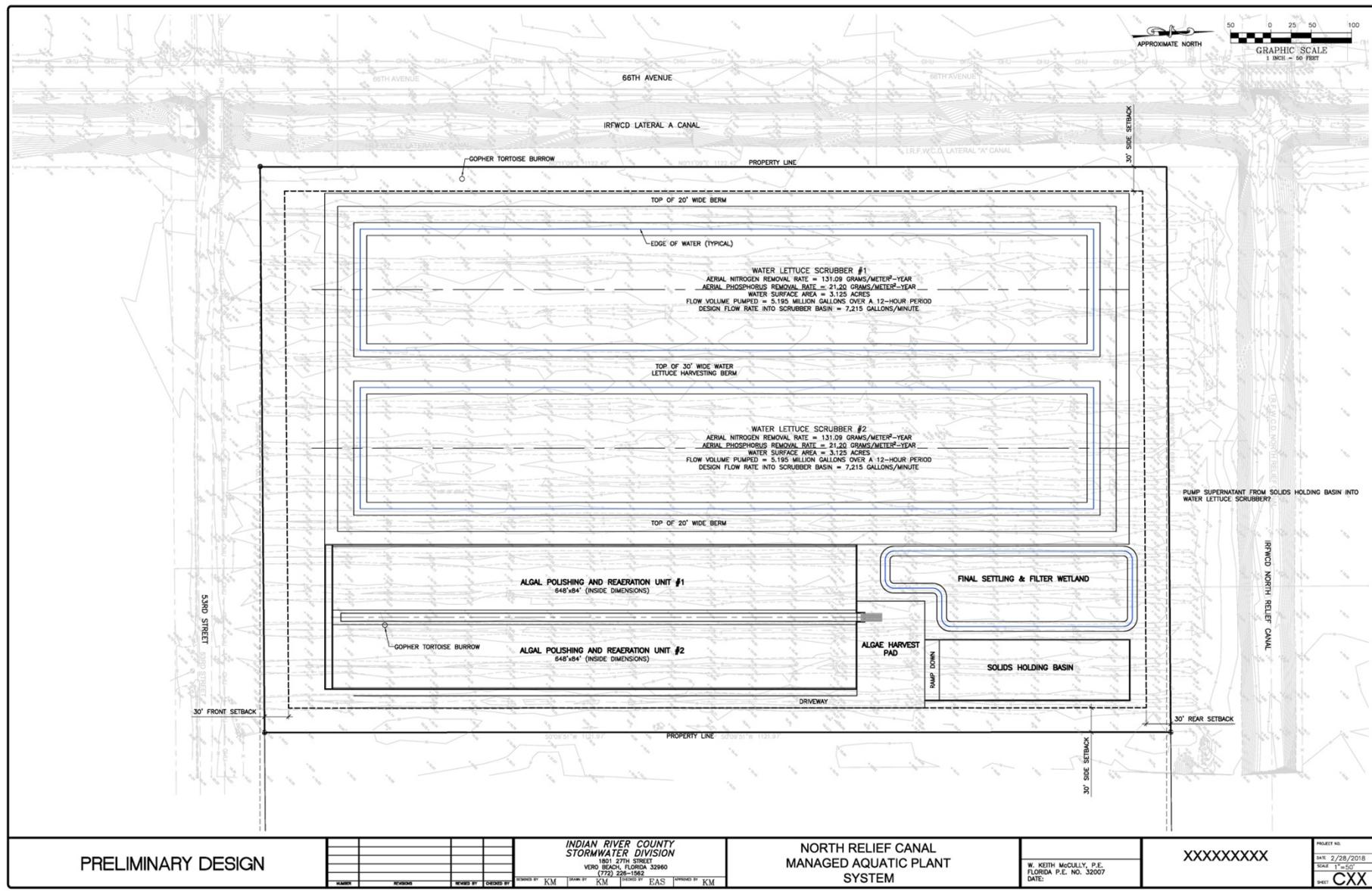
- LEAPS™ system exhibited superior removal performance relative to the stand-alone algae system by both harvest and water quality methods (1/23/2017 to 3/28/2017)
- Continued and focused testing of LEAPS™ system indicated
 - Highest Nitrogen and Phosphorous areal removal rates in water lettuce tanks, followed by algae module; removal rates exhibited positive correlation with influent concentrations
 - Nitrogen and Phosphorous areal removal rates exceed those exhibited by the Egret Marsh ATS™ facility
 - Areal removal rates calculated by water quality and harvest-based methods were nearly identical for Nitrogen, Phosphorous ARR's higher via water quality method- more conservative harvest calculations used for design
 - Water lettuce crop survived long-term pumping interruptions associated with hurricane IRMA

Stage 3 Final Results: LEAPS™ Module Aerial Removal Rates (ARRs), Harvest-based



Pollutant	Water Lettuce Tanks	Algal Regeneration Unit	Wetland Plants
Nitrogen ARR (g/m ² /yr)	131.09	60.69	46.59
Phosphorus ARR (g/m ² /yr)	21.20	12.93	6.87

PRELIMINARY LAYOUT



Full Scale LEAPS System Estimated Yearly Nutrient Removals



Pollutant	Water Lettuce Basins	Algal Regeneration Unit	Wetland System
Nitrogen Pounds/Year	7,310	1,354	520
Phosphorus Pounds/Year	1,182	288	77