River of Grass Phase I Planning

Water Resources Advisory Commission Issues Workshop
March 20, 2009

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Configuration Information - Instructions

Temperince Morgan, River of Grass Project Liaison/Northern Everglades Program Implementation Manager

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Team Configuration Exercise

- Purpose and Description
- Instructions
- Tentative Schedule
- Available Tools/Reference Materials

Phase I Planning Process- Scope

- "Determine the range and general location of acreage needed north of the Everglades Protection Area for storing, treating, and delivering the water flows needed to restore the Everglades, while enhancing ecological values in Lake Okeechobee and the northern estuaries."

Team Configuration Exercise- Purpose and Description

- **Provide stakeholders with an opportunity to develop Conceptual Configurations** that they believe may best achieve restoration objectives while considering constraints and other relevant factors
  - Utilize information discussed during previous workshops that may be relevant when considering various options for storing, treating, and delivering water

Purpose and Description (cont.)

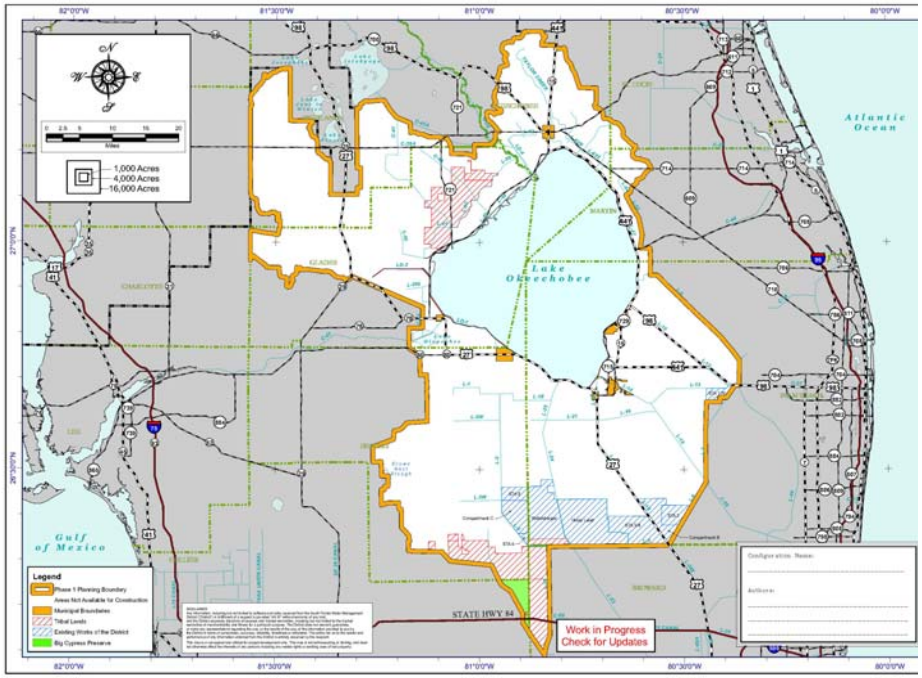
- Following the Team Configuration Exercise, Proposed Conceptual Configurations will undergo further assessment and evaluation by SFWMD staff to estimate benefits, costs, and potential economic impacts
- Ultimate intent is to develop a shorter list of viable configurations that can be presented in draft form to the SFWMD WRAC and Governing Board at their June meetings

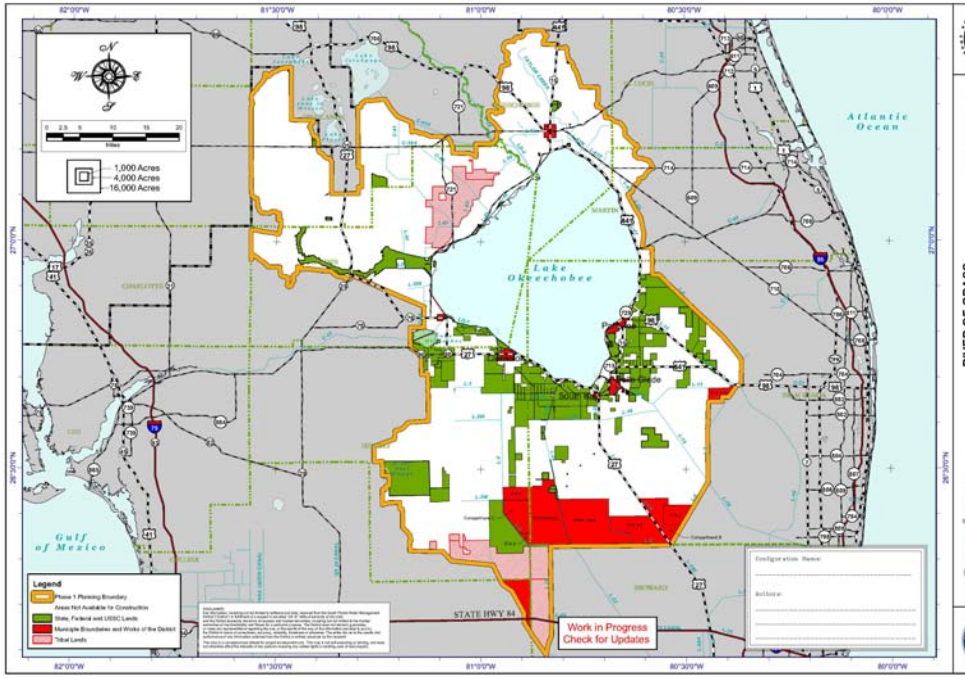
Purpose and Description (cont.)

- To that end, we would like to develop the **fewest number of unique concepts/configurations as possible**, so we are asking that you **team up with others and work together to identify a Team Configuration**
- Two days are scheduled for the Team Configuration Exercise
  - March 31st- April 1st
  - Royal Palm Beach Cultural Center

Instructions

- Base Maps will be provided for you to draw your proposed configuration





Instructions (cont.)

- Tables will be set up around the room each with a facilitator, computer, and reference materials for use during this exercise
  - Facilitator - assist with using Google Earth™, the reference materials, and documentation
  - Computer - Google Earth™ with access to map and land information; links to other reference materials
  - Facilitator Packet - map atlas, hydrologic and water quality performance summary maps/tables, cost information, etc. (more detail on this later)

Instructions (cont.)

- In addition,
  - Wall maps - posted on the walls around the room for easy viewing
  - Reference library - hard copies of reference documents
  - Staff Floaters -
    - General facilitation/questions
    - Technical expertise - modeling, water quality, engineering, economic impacts, costs

Instructions (cont.)

- Team Configurations-
  - As we approach the end of the Phase I Planning Process, we will need to reduce the range of possible configurations into a shorter list of viable configurations that best achieve restoration objectives while considering constraints and other relevant factors
  - Therefore, we would like to develop the fewest number of unique concepts/configurations as possible
  - Hence, we are asking you to team up with others and work together to identify a TEAM CONFIGURATION that reflects your collective approach/ideas

Instructions (cont.)

- Team Configurations (continued)-
  - If a group is able to develop a Team Configuration, but there are a few areas of disagreement or minor differences, you can note these differences and they will be considered during the assessment and evaluation process
  - Each team will need to identify a TEAM SPOKESPERSON to-
    - Report back to the larger group regarding your Team Configuration
    - Answer questions posed by District staff during the evaluation

Instructions (cont.)

- Documentation for each Proposed Conceptual Configuration is needed to ensure each configuration is assessed uniformly and consistent with the information you provided
  - SFWMD staff will need to fully understand intent and aspects that are most important to you
  - Critical pieces of information will be necessary to complete the assessments
  - Facilitator will assist with completing forms

Instructions (cont.)

- Documentation-
  - Facilities Symbols Key- provides consistent symbol for each facility type so that configuration drawings are legible, consistent, and easy to follow
  - Forms –
    - 1 - Summary Sheet of Proposed Configuration including configuration name, team members, spokesperson and general configuration description
    - 2 - Summary Sheet identifying various components of the configuration
    - 3-5 - Provides additional detail for each storage, treatment, or conveyance feature as needed to complete assessment
    - 6 - Identifies infrastructure and other potential impacts that might result from the proposed configuration

Instructions- Summary

- **Develop Team Configuration-** Work as a team(s) to develop a proposed Team Configuration for evaluation
  - Utilize the reference materials provided to assist with development of configuration
  - Utilize the information in the forms to generate discussion regarding what aspects of the configuration are most important to the team/authors
    - e.g., feature type, location, or operations
  - Facilitator can assist with reference materials and forms/documentation
  - Identify Team Spokesperson

Instructions- Summary (cont.)

- **Draw final sketch**
  - Utilize the 11”x17” base maps for sketching/drafting configurations
  - Once team has developed the proposed configuration, draw a final sketch of the configuration on the table-top base map (2’x3’)
    - Using the symbols key
    - Labeling the features per Form 2

Instructions- Summary (cont.)

- **Complete the documentation**
  - Assistance from the facilitator
  - Focus on communicating the aspects of the configuration that are most significant/important to the team/authors
    - Accuracy regarding intent
    - Example -
      - Sizing- team could prefer that a feature is sized to
        - Achieve a particular outcome (eliminate discharges to the estuary)
        - To fit on a particular location/set of parcels
        - To achieve a specific amount of storage at a certain depth

Tentative Schedule (March 31st- April 1st)

- March 31st
  - Hydrologic Modeling Performance Summary Maps
  - Follow-Up on Configuration Information (if necessary)
  - Overview of Instructions for Team Configuration Exercise
  - Team Configuration Exercise
- April 1st
  - Continuation of Team Configuration Exercise (if necessary)
  - Team Presentations
  - Group Discussion

Available Tools/Reference Materials

- River of Grass Vision Statement and Goals
- Problems, Objectives, and Constraints Table
- List of RESOPS Performance Measures/Indicators
- Map Index- Google Earth, Wall Maps, Map Atlas
- Hydrologic and Water Quality Summary Maps/Graphics
- March 20 Presentation which includes Configuration Information
- On-site and web library available
- Staff- facilitators and floaters

Configuration Development Outside of Workshop

- For those of you who would like to get a head-start looking over information and preparing for the exercise

-or-

- Are not able to participate in the Team Exercise on March 31-April 1 -
  - We will be placing the full package of reference materials and forms online
  - They will be located on our Restoration Project Planning link under Related Materials with a new sub-link to “Configuration Data”
  - Tentatively plan to post the package on Tuesday, 3/24

Configuration Development Outside of Workshop

- If you cannot attend on March 31-April 1 but still want to submit a configuration, we would ask:
  - Please look for opportunities to work as a Team or provide input to other Team members who will be attending
  - Submit your proposed configuration package to SFWMD (see contact information next slide) **by April 1st**
  - Include in the package your configuration drawing on base map and the completed forms
  - *Note: A facilitator can still be assigned to assist you with your package (see next slide)*

Team Configuration Exercise Contact Information

- To ask questions, request a facilitator, or submit a configuration package outside of the 3/31-4/1 workshop, please contact:

Joni Warner

561-682-6357

jwarner@sfwmd.gov

SFWMD
3301 Gun Club Road, MS 7110
P.O. Box 24680
West Palm Beach, FL 33406

Questions?

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Configuration Information -Water Quality Modeling Overview

Gary Goforth, P.E., Ph.D., Consultant
South Florida Water Management District

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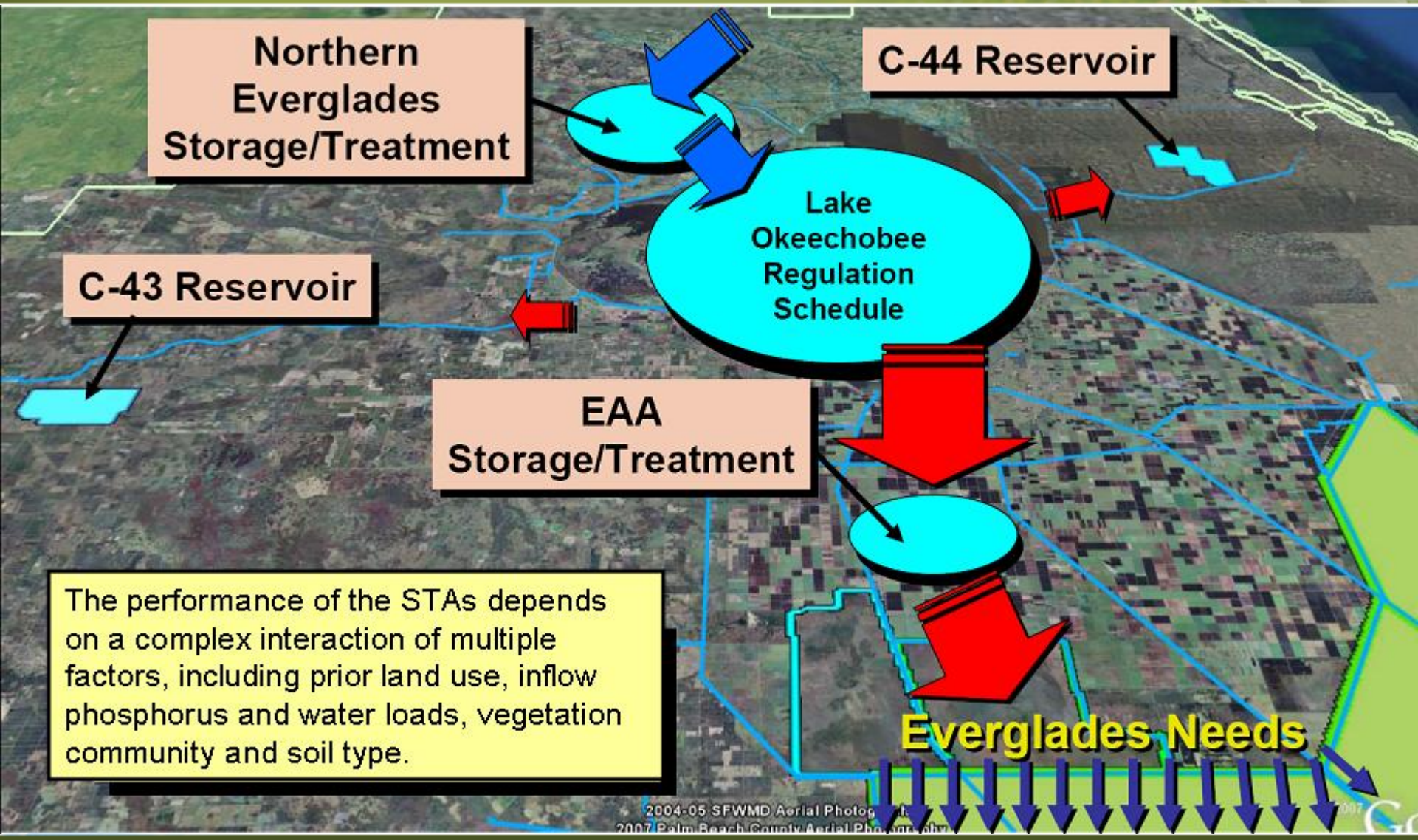
Water Quality Modeling Overview – Topics

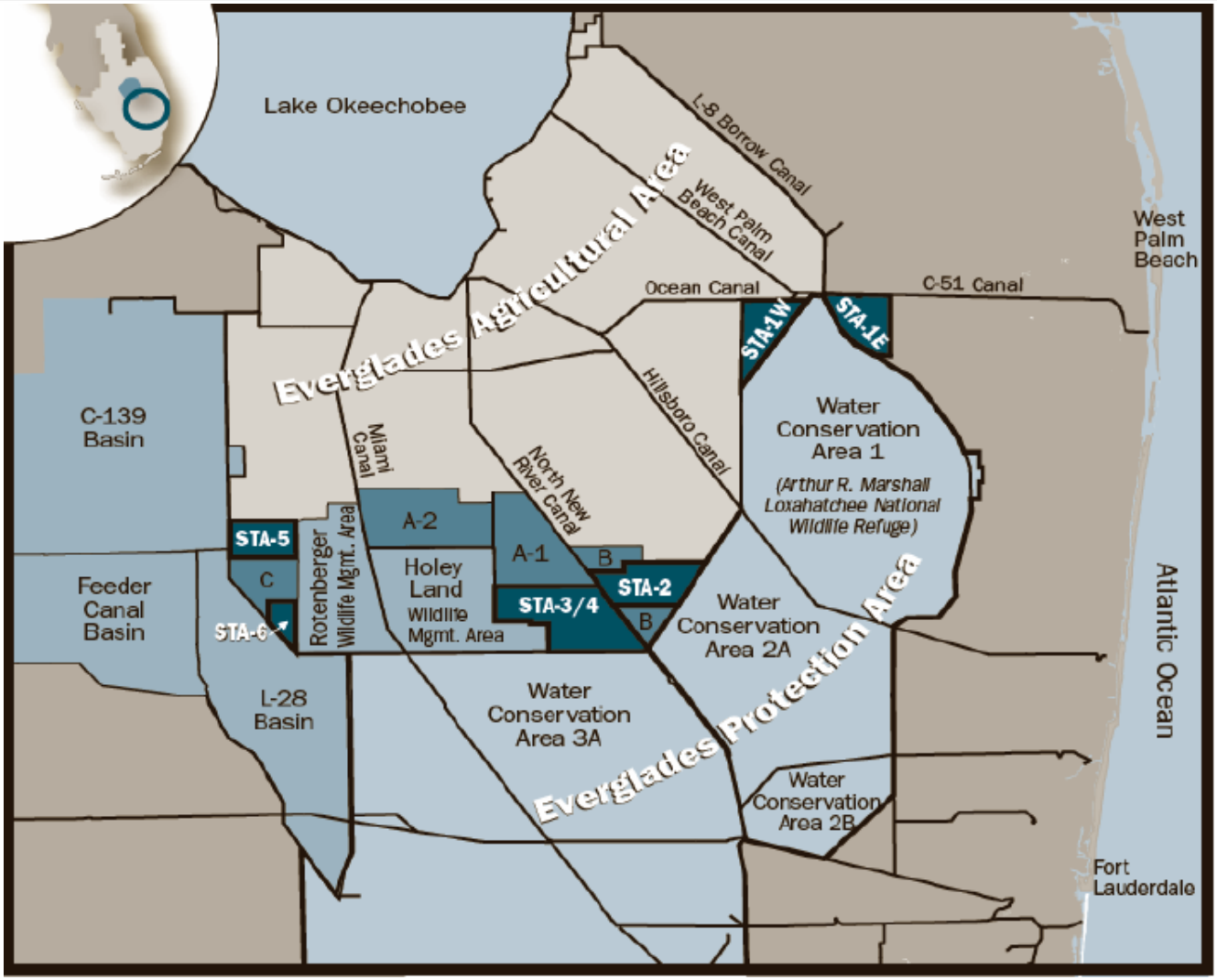
- Background
  - Existing treatment areas and flow volumes
- Water Quality Modeling Approach
  - Steady State Design Model
  - Input requirements and sample output
  - Strengths & weaknesses
  - Relationships between flow and treatment area
  - Next steps

Water Quality Relationships



Background – Existing Treatment Areas

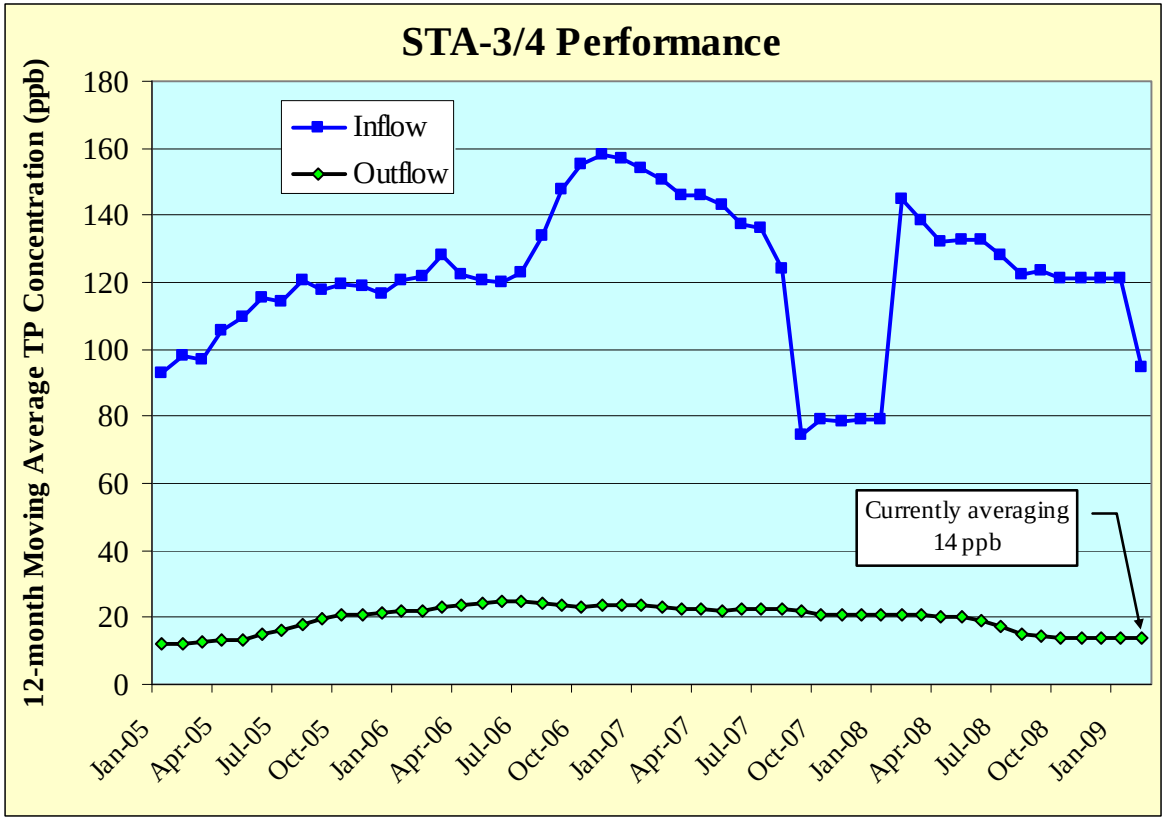
- Existing STAs: 44,900 acres, including 16,500 ac in STA-3/4
- Under construction: 11,500 ac
- Total: 56,500 ac Forecast flow ~1.7 million AF/yr into the Everglades (900,000 – 3 million AF/yr; with EAA Reservoir A1)
- Comp A ~34,000 ac



Background – Water Quality Treatment in STAs

- The District operates the world's largest and most effective treatment wetlands

- Currently the best performing STA is STA-3/4: 16,543 ac
  - Annual discharge levels ranged from 13 ppb – 23 ppb
  - Should improve with upstream reservoir
- Continuing to evaluate measures to improve performance
- Increasing treatment area increases water supply requirements to avoid dry out



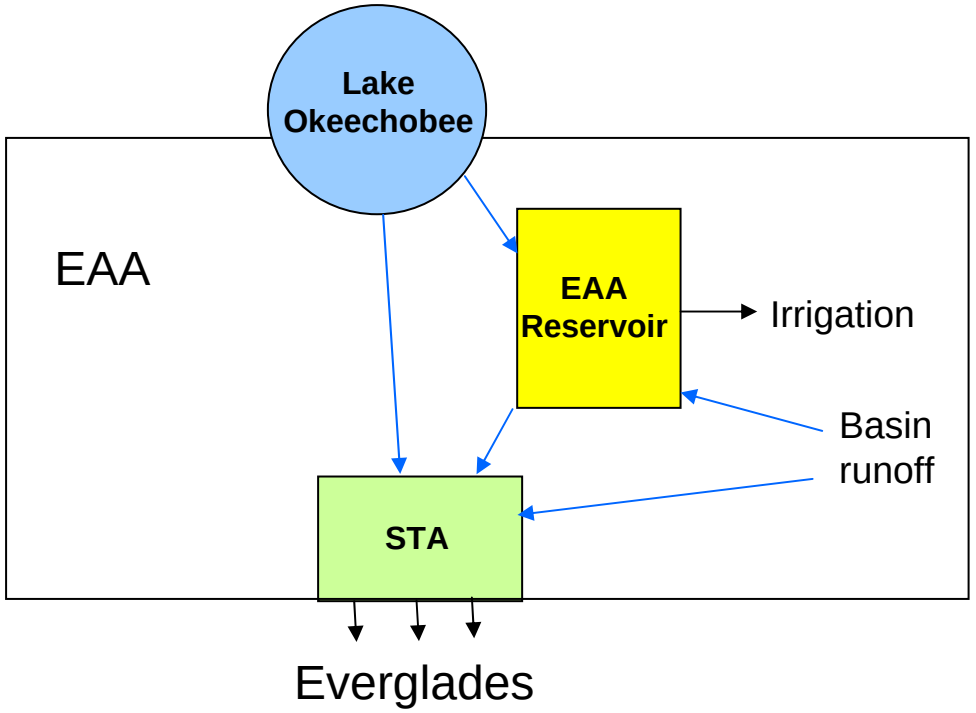
Water Quality Modeling – Background

- Numerous water quality models exist, from simple steady-state models to dynamic models calibrated to STA performance (e.g., DMSTA)
- Need a WQ modeling approach to work in concert with RESOPS – able to quickly evaluate a large number of alternative configurations of reservoirs & STAs
- As with RESOPS, the water quality modeling at this time will not extend into Everglades
- As a rule of thumb, +/- 30% is generally applied to results for a planning level analysis
- This Phase 1 Planning study will be followed by more detailed water quality analyses

Water Quality Modeling – Steady State Design Model

- Steady State Design Model (Kadlec and Knight 1996)
  - Simpler approach than dynamic model (e.g., DMSTA), and therefore able to quickly evaluate long-term average performance of a large number of alternatives
    - This is a strength for this Phase 1 planning study …
    - … but a weakness for forecasting short-term dynamic treatment performance

- Based on long-term average input/output
- A critical input parameter is the effective settling rate, K, that can be calibrated against existing DMSTA simulations:
  - EAA Storage Reservoir Project Implementation Report
  - ~30,000-ac reservoir

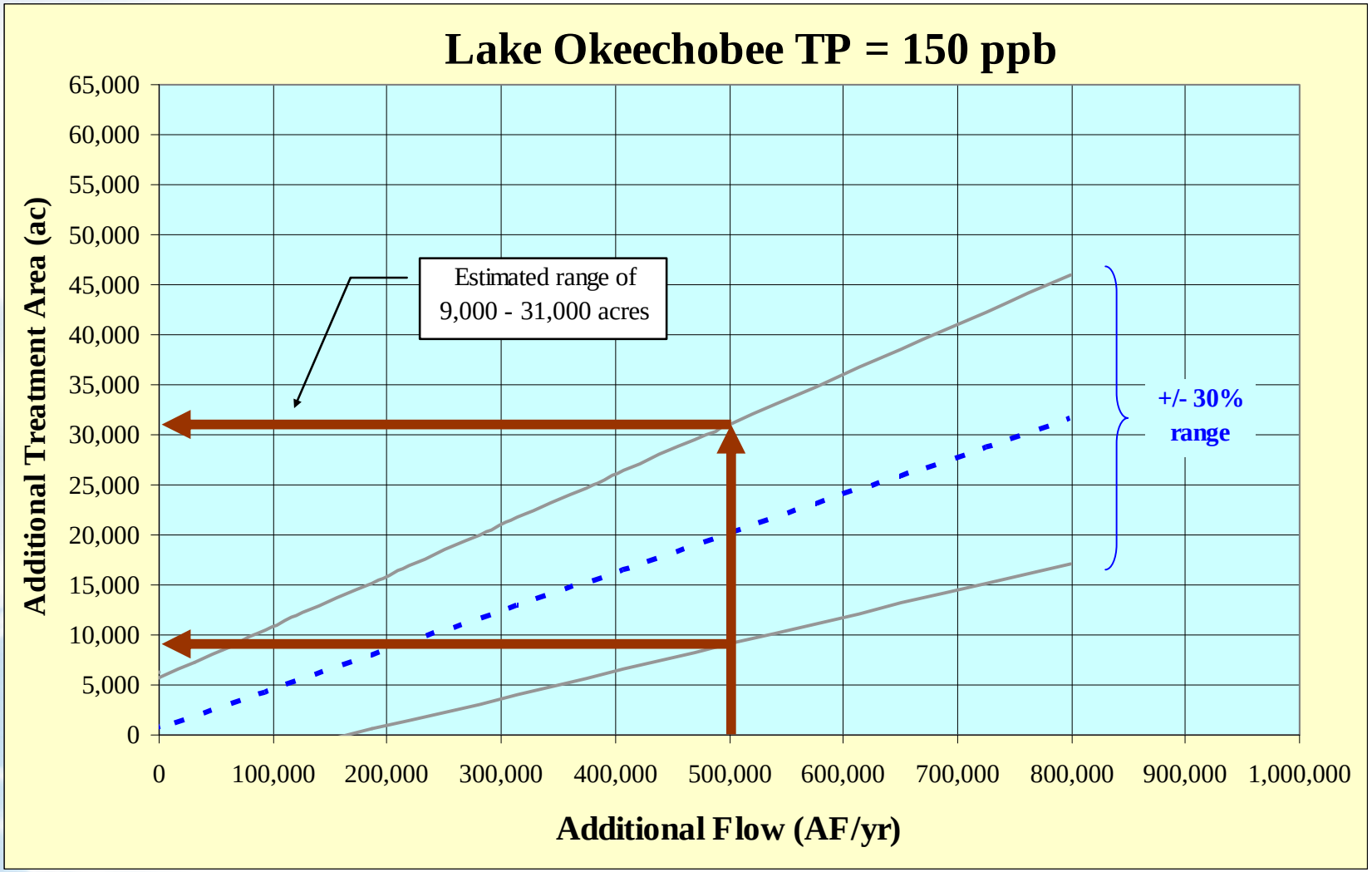


General WQ Relationships Using SSDM

- To supplement the hydrologic capability of RESOPS, the Steady State Design Model was used to derive general relationships between flow and treatment area
  - Estimated reservoir TP removal performance; became part of input to STA-3/4
  - Estimated the treatment area at various TP concentrations for Lake Okeechobee deliveries: 80 ppb, 100 ppb, 150 ppb and 200 ppb
    - Long-term average concentration – higher annual variability
    - Parts per billion – not *metric tons*
- Incorporated many simplifying assumptions that will be evaluated and refined as additional information becomes available, e.g.,
  - TP concentrations in the Basins' runoff are represented by WY1995-WY2006
  - Increase in reservoir and STA acreages will result in reduction of EAA basin runoff based on uniform areal loading rates
  - STAs off-line for maintenance and hurricanes (5% and 4%, respectively)
  - 40% of STA will be emergent vegetation followed by submerged aquatic vegetation

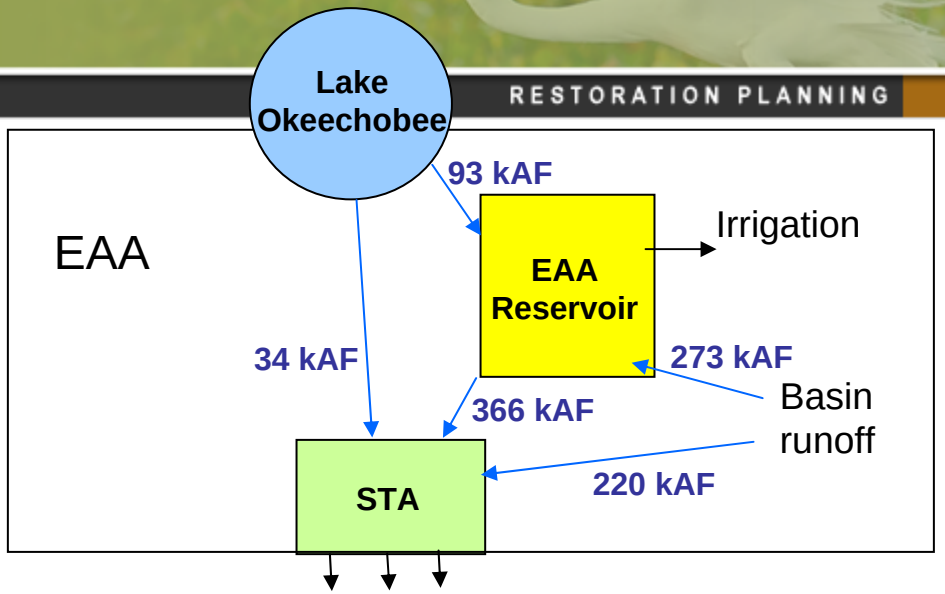
Nomograph of Treatment Area as a Function of Flow

STA-3/4 has 16,543 acres and a baseline average of 590,000 AF/yr.



Estimates of Additional Treatment Area

- Preliminary application of SSDM to RESOPS results



Preliminary Estimates of Additional Treatment Area (acres)*

% of Target Met	Additional Flow (AF/yr)	Assumed Lake TP (ppb)			
		80	100	150	200
75%	31,607	4,477	5,312	7,304	9,040
80%	125,715	7,282	8,764	12,182	15,073
85%	219,822	10,090	12,213	16,967	20,930
90%	313,929	12,894	15,661	21,715	26,685
95%	408,036	15,695	19,108	26,440	32,376
100%	502,143	18,494	22,556	31,148	38,025

*** In addition to 16,543 acres in STA-3/4; includes 30% uncertainty factor**

Spatial Variability of Treatment Performance

- From preliminary SSDM analyses:
  - An STA in the STA-1E/1W Basins may need to be ~ 25% larger than the area estimated for the central EAA due to higher Basin runoff and higher Lake Okeechobee TP
  - Additional reservoir/STA in other EAA sub-basins should have similar performance as the central EAA
  - A reservoir-assisted STA in the C-139 Basin may need to be approximately twice the area estimated for the central EAA
    - STA-5 is not performing as well as other STAs
    - Dry out becomes a significant concern unless supplemental water is available

Water Quality Models – Next Steps

- Link with RESOPS
  - Incorporate equations from the Steady State Design Model directly into RESOPS
- This Phase 1 Planning study will be followed by more detailed water quality analysis

Questions?

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Configuration Information – Cost Estimating Approach and Cost Relationships

Matt Morrison, Lead Project Manager,
Everglades Restoration

sfwmd.gov/riverofgrass

Cost Categories

- Land Acquisition
- Land Remediation / Corrective Action
- Project Implementation
  - Planning, Design, and Permitting
  - Construction
  - Construction Management Services
  - Engineering During Construction
- Operations and Maintenance

General Guidelines

- All cost estimates in today's dollars
- Appropriate contingency amount applied to each cost category

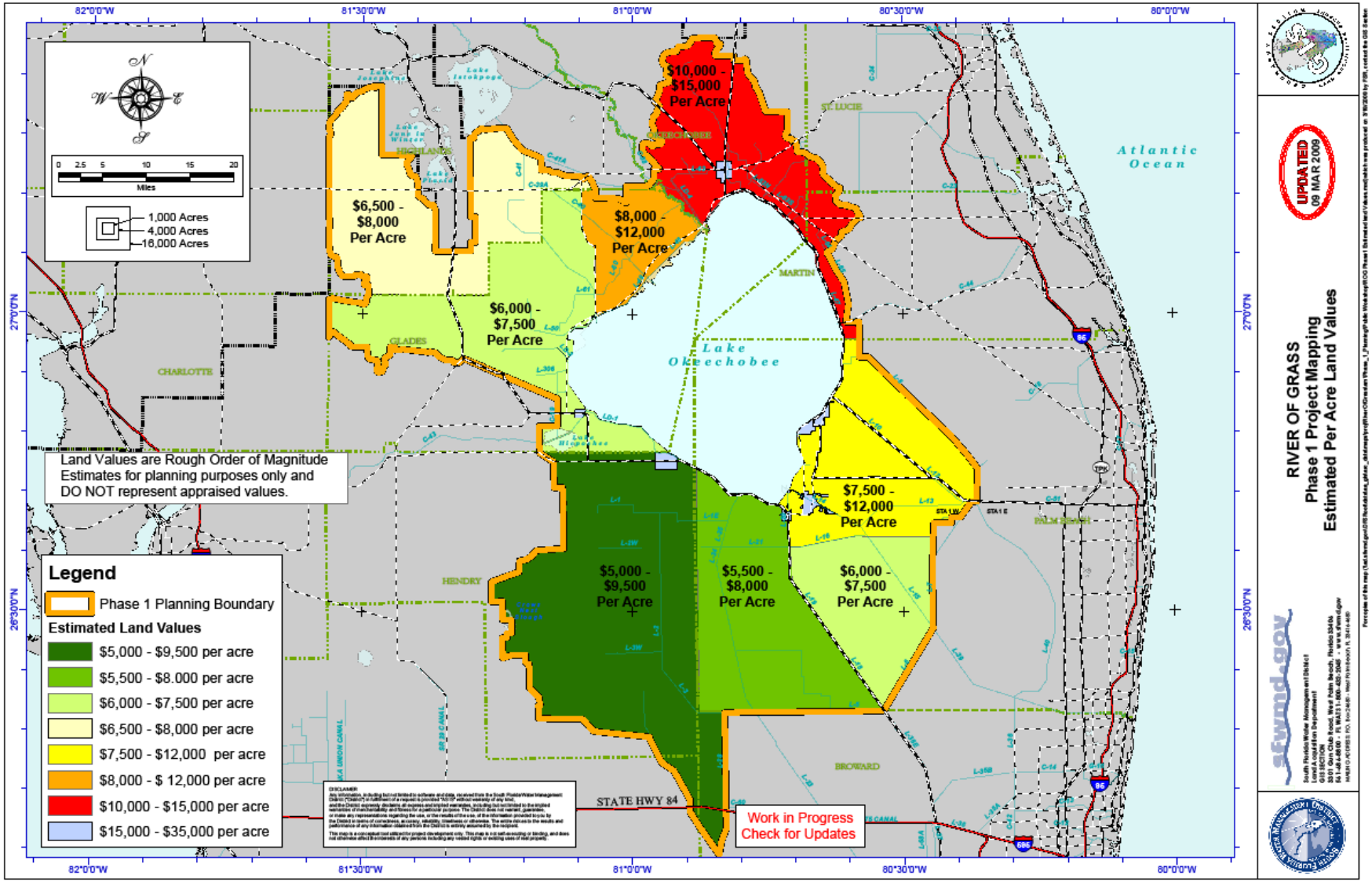
Definitions

- RED
  - Considerable Costs, Schedules, and Complexity
- YELLOW
  - Moderate Costs, Schedules, and Difficulty
- GREEN
  - Reasonable Costs, Schedules, and Difficulty

Land Acquisition Costs - Approach

- Create range of cost per acre for regions within the Planning Boundary
- Once configuration boundary is defined, provide detailed cost per acre based on current land use and all available appraisal and market data
- Contingency costs include Title Fees, Attorney Fees, and all Other Costs associated with land acquisition

Land Acquisition Regional Cost Ranges



Ability to Acquire or Utilize Lands

- RED
  - Developed Urban Lands; Lands within Municipal Boundaries; Lands with Existing Restoration Projects; Tribal Lands
- YELLOW
  - Private Ownership; Utility Parcels
- GREEN
  - South Florida Water Management District, State, and U.S. Sugar Corporation Owned Lands

Land Remediation / Corrective Action Costs - Approach

- Corrective actions only required due to the change in land use to a restoration project
- Land owner normally not held liable for these types of corrective actions
- Per acre cost estimates are based on similarities between land uses and cost of corrective actions

Land Remediation / Corrective Action Costs

- RED
  - Vegetable Farming, Sod
- YELLOW
  - Dairy Farms, Sugar Cane, Citrus
- GREEN
  - Pasture / Rangelands; Undeveloped, Forested or Scrub Land

Project Implementation Costs - Breakdown

- Planning, Design, and Permitting Costs
- Construction Costs
  - Direct costs estimated with unit costs for major line item bids
  - Overhead and contingency costs based on percentage of total direct costs
- Engineering During Construction Costs
- Construction Management Services Costs

Direct Construction Costs - Approach

- Convert requirements of a component to physical features
  - Volume of storage becomes Length, Width, Height, and Slope of Embankment
- Convert physical features to amount of construction material required
  - Length, Width, Height, and Slope of Embankment becomes Volume of Fill Material
- Apply a unit cost based on recent construction projects and industry standards to construction material required

Direct Construction Costs Example

COMPONENT	UNIT
EMBANKMENT / LEVEE / BERM	
Demuck	Cubic Yards
Embankment	Cubic Yards
Compaction	Square Yards
Slope Dressing (Grading)	Square Yards
Slope Protection RipRap	Cubic Yards
Slope Protection Grassing	Square Yards
Cutoff Wall	Linear Feet
Access Road	Square Yards

Direct Construction Costs - Approach

- Unit costs include all Labor, Materials, and Direct Costs to construct that aspect of that feature for that component
- Determination of which Unit Cost to use is based on:
  - Existing Land Conditions
  - Soil Conditions
  - General Location
  - Specific Project Requirements
- Typically amount of earthwork is most significant cost driver

Site Preparation

- RED
  - Removal of Buildings, Facilities, Paved Areas
- YELLOW
  - Removal of Trees, Brush, Vegetation
- GREEN
  - Re-grading Pasture Lands, Open Fields

Typically RED 2 to 3 Times Higher Than GREEN

Component Structural Foundation

- RED
  - Muck/organic soil depths greater than 1 foot to be removed, Significant blasting required
    - Generally descriptive of south of Lake Okeechobee
- YELLOW
  - Sandy soils requiring to be mixed with clay
    - Generally descriptive of upper Lake Okeechobee Watershed
- GREEN
  - Clayey-sandy soils with less than 1 foot of organics to be removed
    - Generally descriptive of lower Lake Okeechobee Watershed

Infrastructure Impacts

- RED
  - Remove and Construct New Power Transmission Lines
  - Remove and Construct New Railroad; Construct New Canal (~250 feet wide)
- YELLOW
  - Construct New Road; Construct New Bridge
- GREEN
  - Avoid Existing Infrastructure

Direct Construction Costs - Approach

- Apply a Unit Cost to Specific Structures Based on Flow Capacity (Cubic Feet per Second – CFS)

COMPONENT	UNIT
INFLOW CONTROL STRUCTURES	CFS
OUTFLOW CONTROL STRUCTURES	CFS
INTERNAL CONTROL STRUCTURES	CFS
HIGH FLOW GRAVITY STRUCTURES	CFS
SMALL PUMP STATIONS	CFS
MEDIUM PUMP STATIONS	CFS
LARGE PUMP STATIONS	CFS

Operation and Maintenance Costs - Approach

- Annual cost estimates based on experience
- Includes Labor, Contractual Services, Equipment, and Other Direct Costs
- Assumes typical conditions
  - Extreme storm events and failures not included
- Does not include Regional, Administrative, or Management Costs for expansion of the entire water control system

Operation and Maintenance (O&M)

- RED
  - Large Pump Stations (greater than 1,500 cubic feet per second (cfs))
- YELLOW
  - Small Pump Station (less than 1,500 cfs)
  - Active / Movable Structures
- GREEN
  - Passive / Fixed Structures

Large Pump Station O&M 7 Times Higher Than Small Pump Station O&M

Small Pump Station O&M: Diesel 2.5 Times Higher Than Electric

Total Project Cost

- Total Land Acquisition Costs = Land Acquisition Costs + Contingency
- Total Corrective Action Costs = Corrective Action Costs + Contingency
- Total Construction Costs = Direct Construction Costs + Overhead Construction Costs + Contingency + Planning, Design, and Permitting Costs + Engineering During Construction Costs + Construction Management Services Costs
- Total Project Cost = Total Land Acquisition Costs + Total Corrective Action Costs + Total Construction Costs

Questions?

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Configuration Information – Considerations for Developing a Proposed Configuration

Sue Ray, Chief Engineer, Everglades Engineering

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Available Resources and Tools

- Vision Statement, Goals, and Phase I Planning Process Scope
- Problems, Objectives, and Constraints Table
- Approaches and Concepts
- RESOPs Performance Measures / Indicators
- RESOPs Performance Maps

Available on the Reviving the River of Grass Website, Related Materials - *Restoration Project Planning*

Proposed Configuration

- Provide level of detail necessary to convey your Concept and the aspects that are important to you
- Entire Configuration evaluated based on ability to achieve goals and cost
- Entire Configuration needs to be functional
- Ability for water to flow from start to finish

Components of a Proposed Configuration

- Probably more than one component per proposed Configuration
- Each component serves one or more function
  - Storage
  - Treatment
  - Conveyance
- Components are typically interconnected based on functional relationship

Moving Water – Gravity Flow

- Water flowing downhill to lower elevation
- Requires a structure at water source (e.g. Lake Okeechobee) to regulate amount of flow downstream
  - Structure – Adjustable or Fixed
- To move water to the final destination depends on:
  - Starting Elevation
  - Downstream Topography
  - Frictional Resistance to Flow

Moving Water – Pumped Flow

- Water flowing uphill to a higher elevation
- Requires a mechanical system with power source (e.g. Pump Station) to lift the water
- If higher elevation sufficient, water can gravity flow to final destination

Acreage Required

- Component has infrastructure features
  - Roads, Embankments, Seepage Canals
- Assume 10% of acreage is required for infrastructure features of a component
- Example
  - Total Area of a Component = 10,000 acres
  - Acreage Required for Infrastructure Features
    - 10,000 acres x 10% = 1,000 acres
  - Remaining Acreage Available for Water
    - 10,000 acres – 1,000 acres = 9,000 acres

Embankment Heights

- Embankment Height
  - Height above ground elevation
- Water Depths above Ground ~ 2 to 4 Feet
  - Typical embankment height ~ 6 Feet
  - Embankment typically vegetated
- Water Depths above Ground Greater than 4 Feet
  - Typical embankment height ~ 2 times the water depth
  - Embankment typically protected

Seepage Control

- Configuration can not adversely impact the ground water and surface water levels on adjacent lands
- Maintain water level / Storage capacity
- Reduce other operational controls such as pumping
- Seepage Control Features
  - Seepage Canals, Liners, Cutoff Walls
- Type of seepage control feature based on water depth/site geology combination and costs

Operational Requirements

- Examples of operational requirements that could limit ability to achieve benefits
  - Gravity Flow Only from Lake Okeechobee
    - When levels too low to gravity flow, no flow out of Lake Okeechobee to benefit other areas
  - Use only a specific Lake Okeechobee Regulation Schedule
  - No flow from Lake Okeechobee diverted for water supply needs or to storage components north or south of Lake Okeechobee
  - Storage components can not go dry
  - Treatment components can go dry

Summary Advice

- Provide enough details to convey the intent of your Proposed Configuration and the most important aspects to you
- Specifying requirements not important to you may create unwanted restrictions that limit benefits achieved or undeservedly increase costs

Questions?

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Next Meeting/Future Meeting Topics

Temperince Morgan, River of Grass Project Liaison/Northern Everglades Program Implementation Manager

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Next Meeting- Date and Location

Next WRAC Issues Workshop

March 31/April 1, 2009

Royal Palm Beach Cultural Center
151 Civic Center Way
Royal Palm Beach, FL
10:00 a.m. – 4:00 p.m.

Next Meeting- Meeting Topics

Meeting Topics

- Local Government Presentations
- Hydrologic Modeling Performance Summary Maps
- Continuation of Configuration Information (if necessary)
- Instruction Overview/Group Configuration exercise
- Team Presentations of Proposed Configurations
- Group Discussion

Phase I Planning
Future Meetings and Topics

Future Meetings

(10:00 a.m. – 4:00 p.m.)

- April 16/17, SFWMD Lower West Coast Service Center, Ft. Myers
- May 6, PB County Fire & Rescue Dept., Herman W. Brice Training Complex, West Palm Beach

Future Meeting Topics

- Group configurations
  - Modeling Results
  - Benefits Information
  - Initial Cost Estimates
- Presentations and Topics as Identified by Participants

Phase I Planning
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Questions?

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