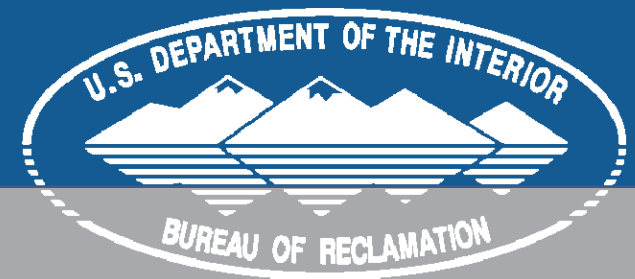
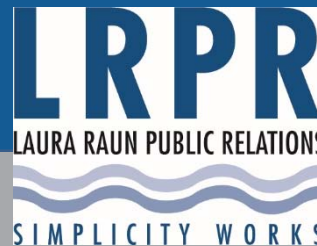




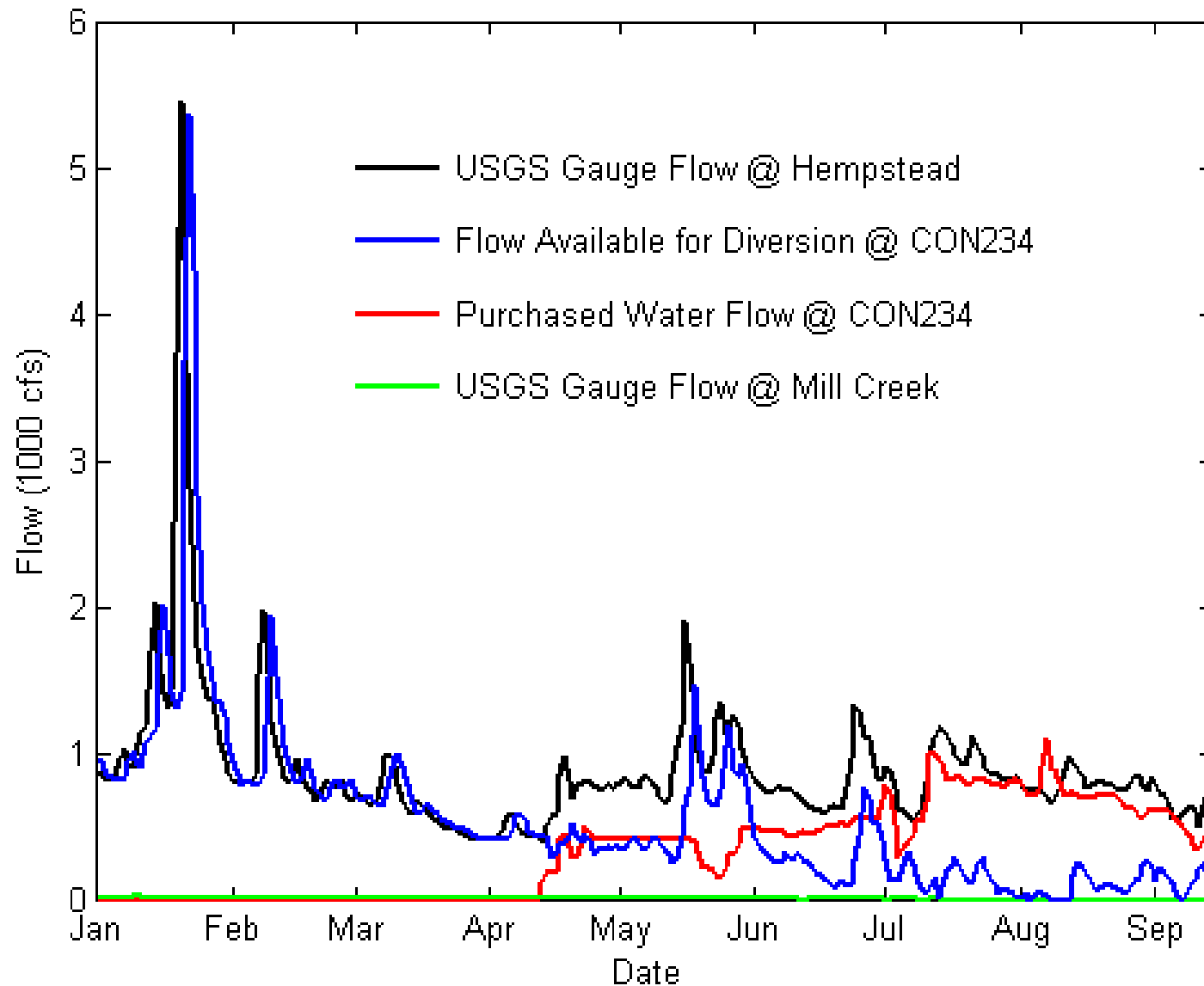
Gulf Coast Water Authority

Drought Contingency Plan Update
US BoR WaterSMART Grant
Drought Task Force Meeting #2

04/17/2017



Worst Fears in the Brazos River Basin?



US BoR WaterSMART Program

- Proposal Submitted 4/11/16
- Notice of Award 6/23/2016
- Contract Initiated 10/2016
- Financial Part:
 - 2 Year Contract (Oct '16-Oct '18)
 - 50-50 Cost Share with GCWA
- Purpose:
 - Pro-Active Drought Management
 - Build Long-Term Drought Resiliency
 - Study potential mitigation strategies
- Potential Benefits for future Title 16 Funds
 - Strategy Implementation



Gulf Coast Water Authority

Drought Contingency Plan Update

Response to Funding Announcement: R16-FOA-DO-005

Applicant:

Gulf Coast Water Authority
Ivan Langford, General Manager
3630 FM 1765
Texas City, TX 77591

Project Manager:

Jordan Fumans, PhD, PE, PG, CFM
1000 Heritage Center Circle, Suite 141
Round Rock, TX 78664
Email: Jordan.Fumans@lrewater.com
Phone: 512-736-6485

April 11, 2016

GCWA's Drought Contingency Planning Goal

- Ensure GCWA Customers have water needed during future droughts
- Not: Curtailment
- Not: Rationing
- Not: Relying only on Watermaster
- Is: Maintaining Customer's Expectations
- Is: Smart Planning to maintain & grow Texas economy



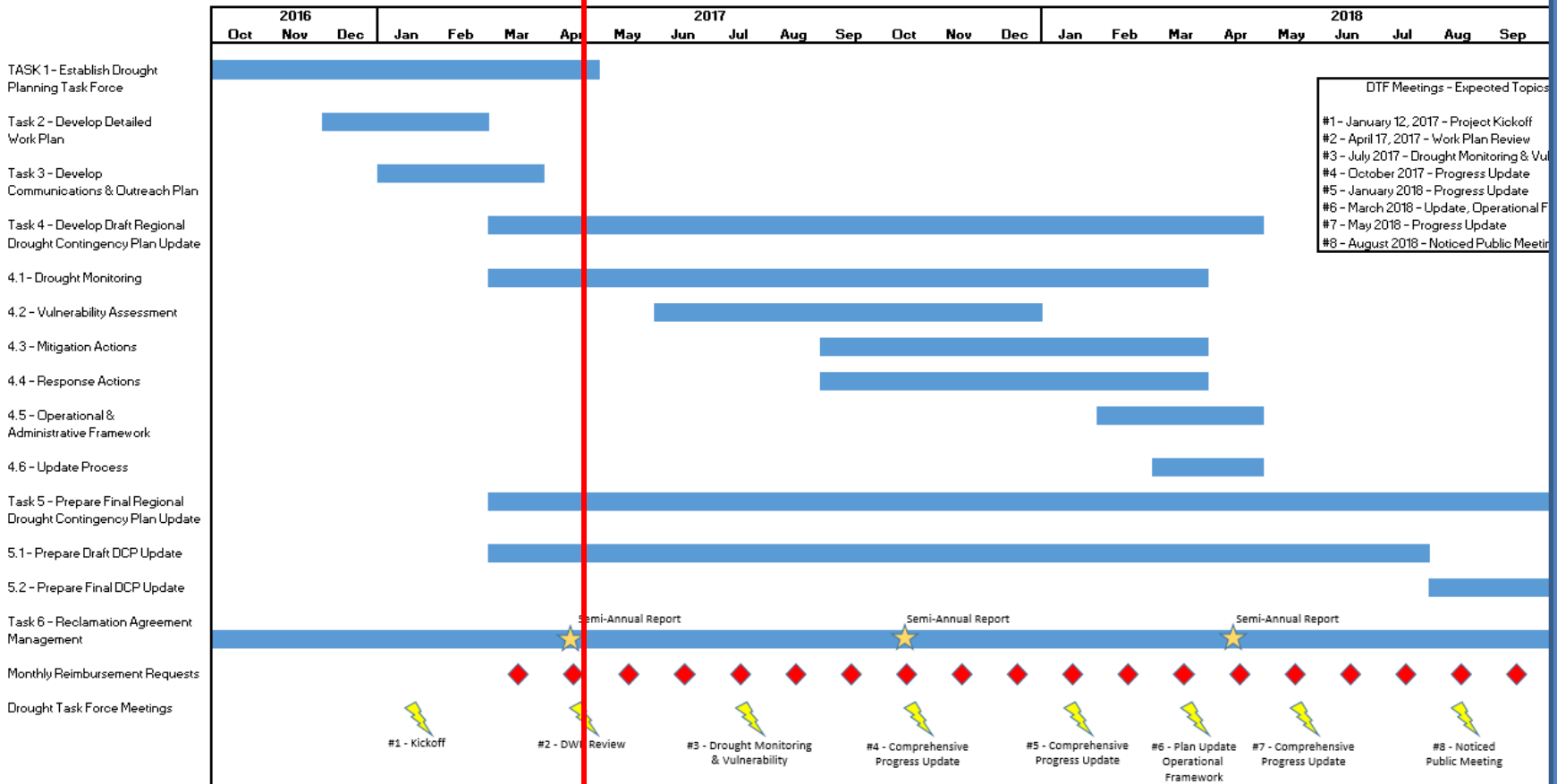
Today's Agenda

- Discuss Detailed Work Plan
 - Gather Comments, incorporate
 - Submit revised document to US BoR by 4/21/17
- Discuss Communication & Outreach Plan
- Review Existing DCPs:
 - BRA
 - GCWA
 - GCWA Customers
- Set Next Meeting
 - July 17?

Detailed Work Plan

- Lays out Tasks to be completed in project
 - Plan Formulation
 - Drought Task Force Formation
 - Communication & Outreach
 - Drought Monitoring → **Dashboard**
 - Vulnerability Assessment → **Dashboard with Stat. Analysis/Prediction**
 - Mitigation Actions →
 - **Canal Loss Monitoring & Reduction**
 - **Assess Conjunctive Use of Groundwater during drought (Local & Up-Basin)**
 - **Additional Actions suggested by DTF**
 - Response Actions →
 - **Review Existing DCPs – ensure consistency**
 - **Implementation Rules for Mitigation Actions**
 - Admin & Update Process

DCP Update Schedule

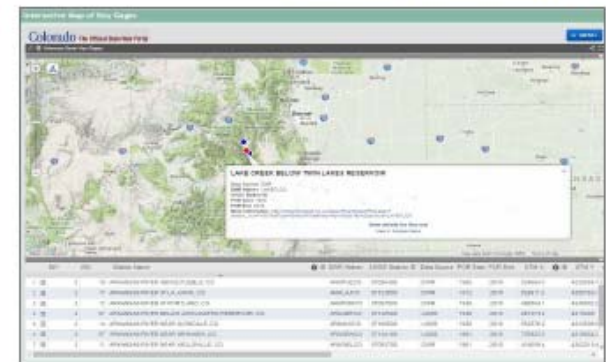
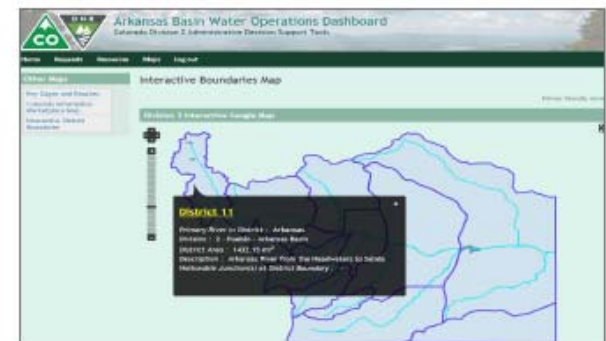


Drought Analysis – Dashboard Creation

- US BoR Requirement –
 - Data Tracking & Analysis
 - Drought Prediction
 - Climate Change & Preparedness
- Dashboards:
 - Online data management & analysis tool.
 - Similar to work LRE already does
 - Drought forecasting and likelihood analysis – similar to LCRA methods



FIND ME AT: <http://www.cdwrdiv2.us>



Dashboard Scope

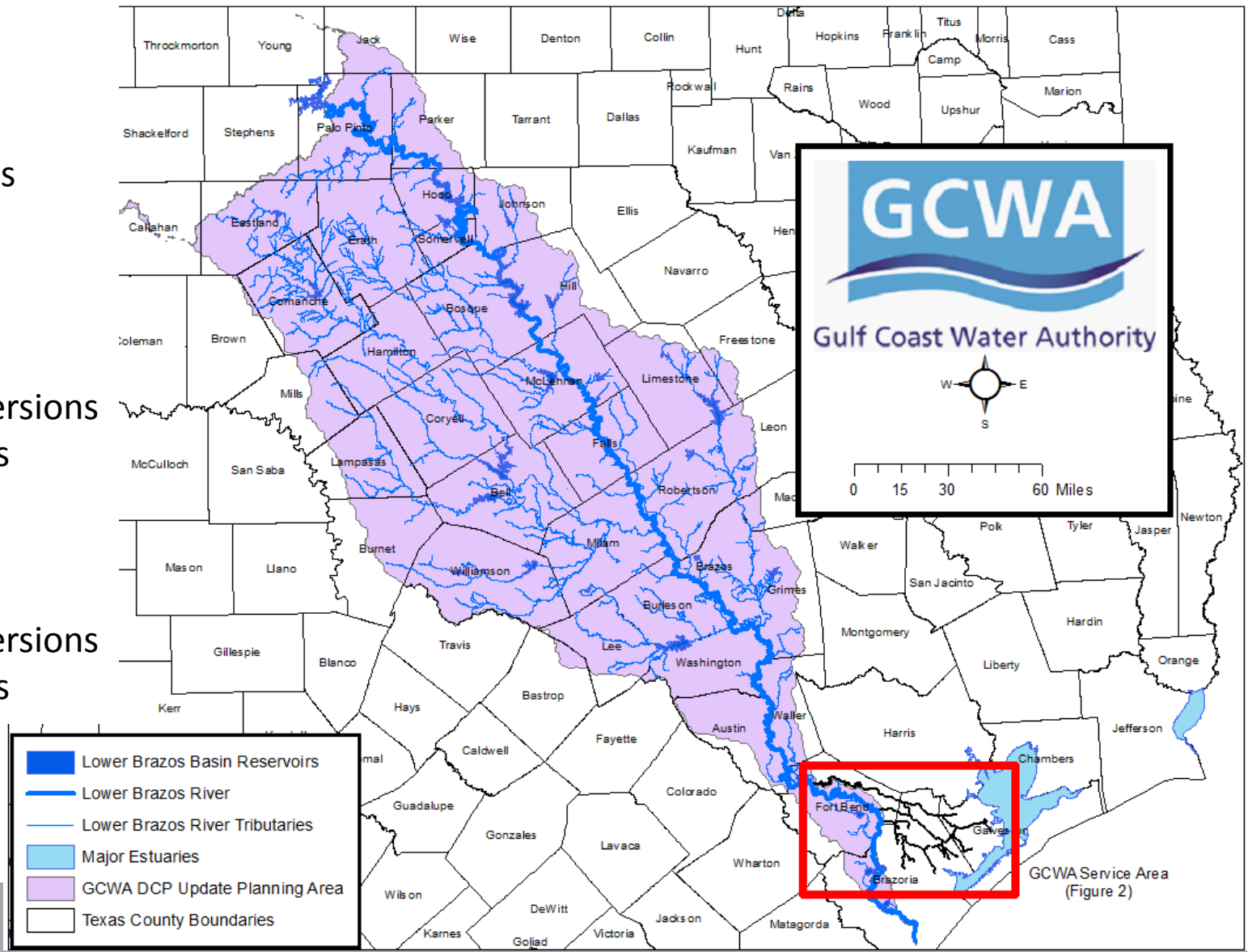
USGS Gauges
Streamflow
Reservoir Levels
NOAA Predictions
Other?

Water Rights

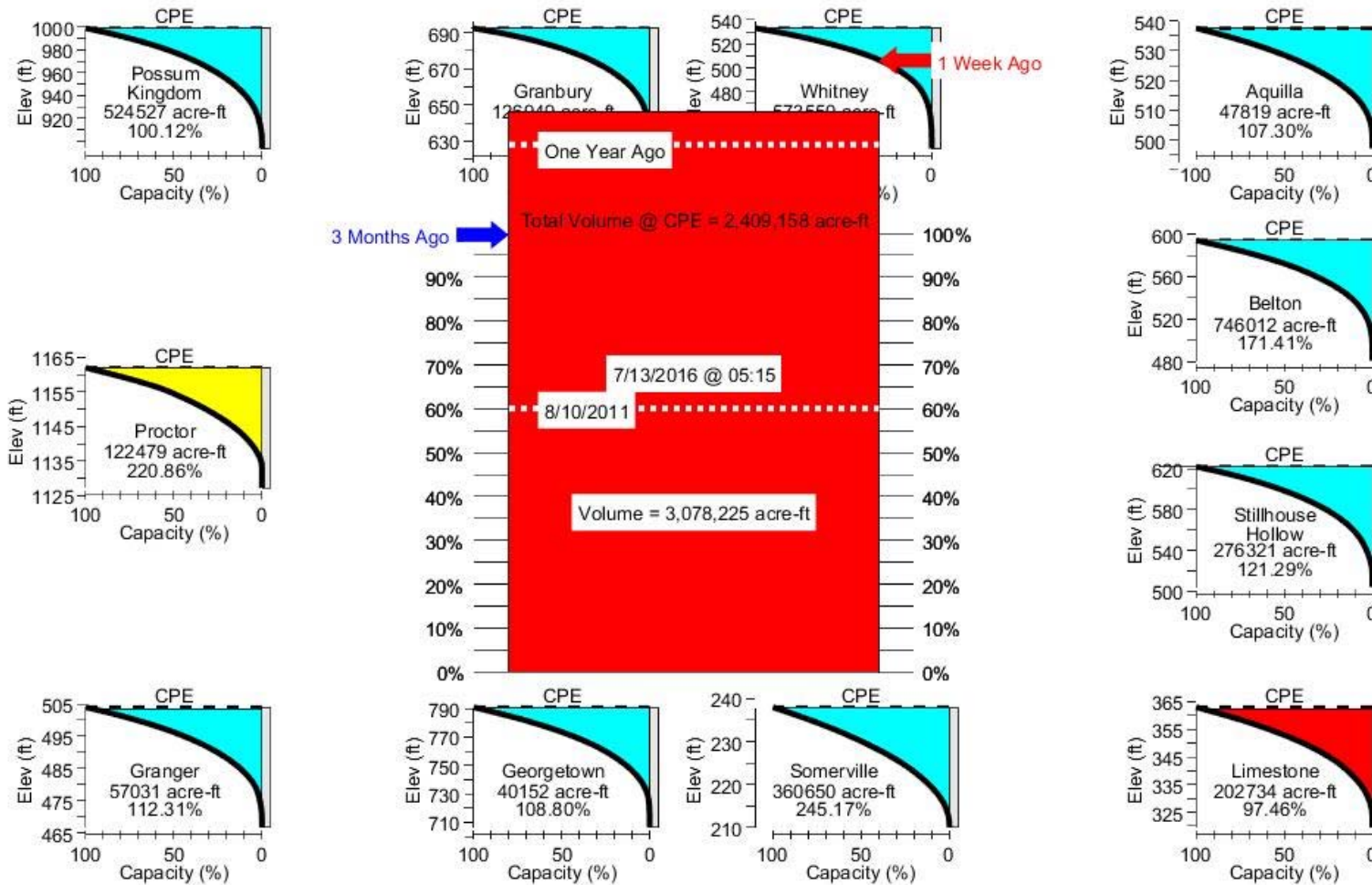
- Locations
- Historical diversions
- Trend Analysis

GCWA Demands

- Locations
- Historical diversions
- Trend Analysis



Sample Dashboard Analysis of Data

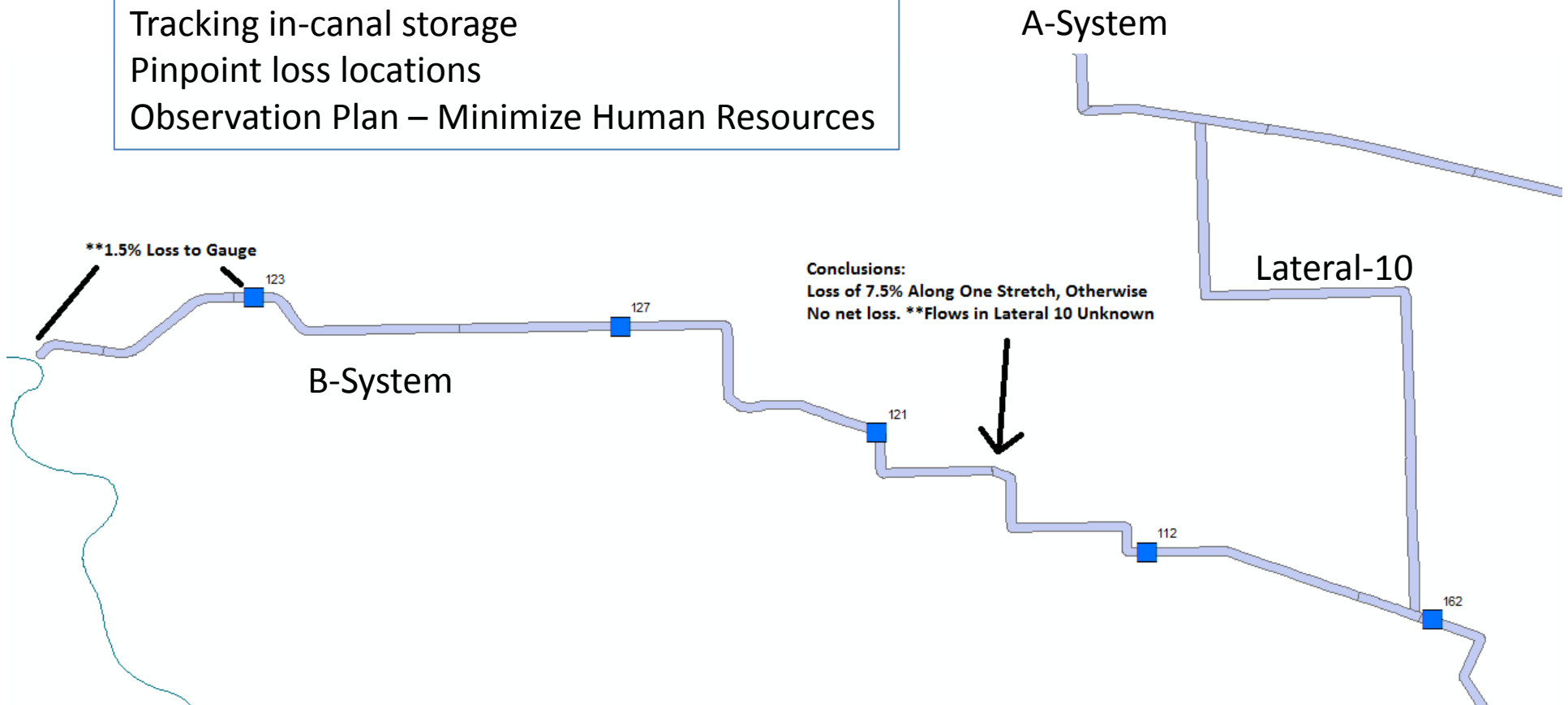


Canal Losses – Monitoring & Reduction

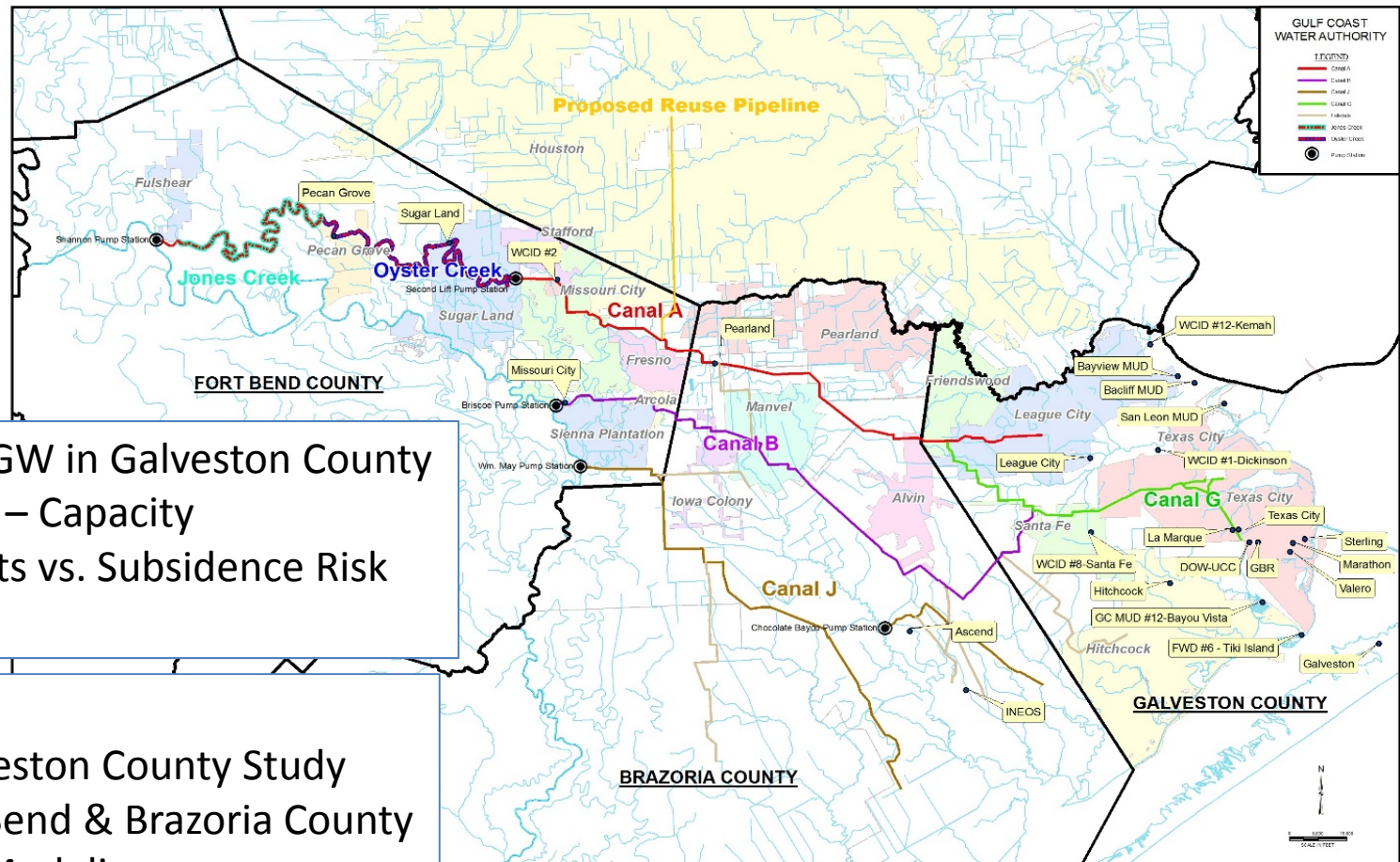
2014 Gain-Loss Study of GCWA System

Determine:

- Locations for water level/flow measurements
- Tracking in-canal storage
- Pinpoint loss locations
- Observation Plan – Minimize Human Resources



Local Groundwater Assets & Usage



GCWA Studying GW in Galveston County

- Existing Wells – Capacity
- Pumping Limits vs. Subsidence Risk
- HGSD Rules

This Study:

- Build on Galveston County Study
- Include Fort Bend & Brazoria County
- Literature & Modeling
- Data Compilation & Analysis

Upstream Groundwater

Possibility:

Pump Groundwater into Brazos during low-flow

Recover downstream by GCWA

Hurdles:

Conveyance Loss

Expense

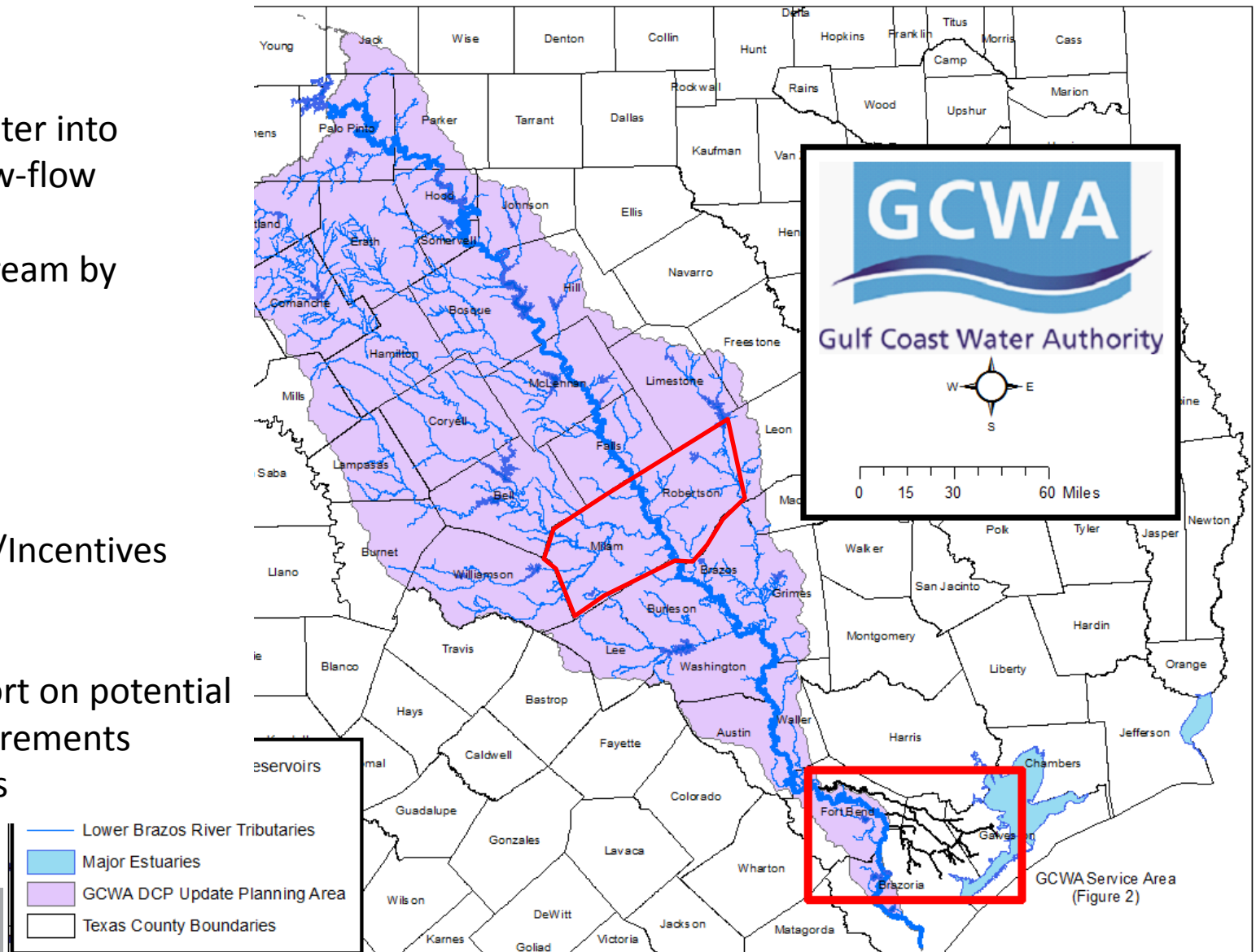
Land Availability/Incentives

This Study:

Research & Report on potential

Permitting Requirements

Preliminary Plans



Communications & Outreach Plan

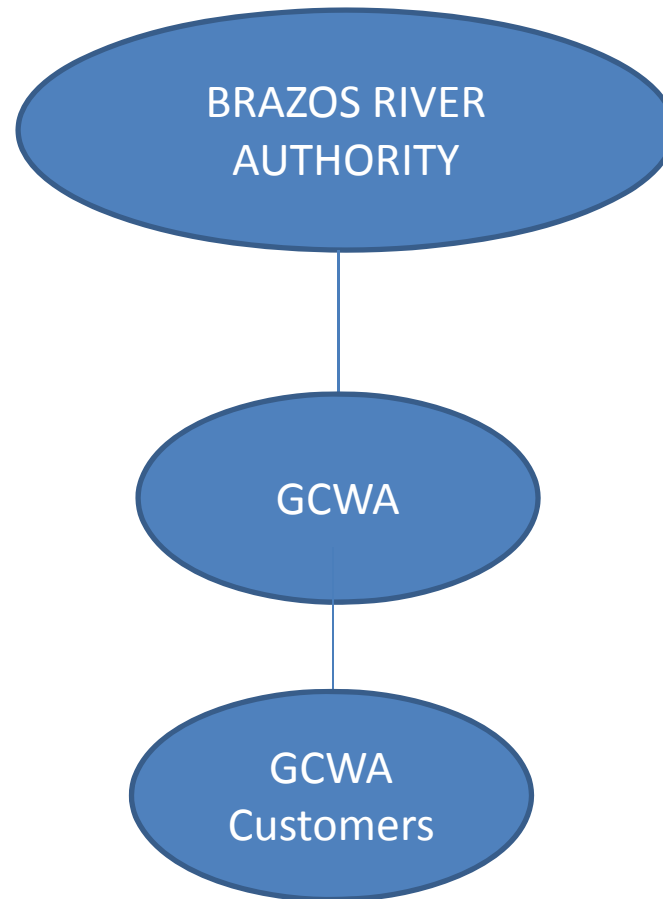
Under this task, a Communications & Outreach Plan (C&O Plan) will be developed to optimize stakeholder and public engagement in preparation of the GCWA DCP update. The C&O plan will direct how information regarding the update will be made available to stakeholders and the public, how meetings will be announced, and interested parties may provide information or comments during the plan development.

How do YOU want communication to run during this project?

Project Website: www.lrewater.com/GCWA_DCP

Propose – Laura Raun Public Relations coordinate & compile C&O plan

Existing Brazos Basin DCPs



BRA Drought Contingency Plan

- Adopted October 2012
 - Possibly due for revision 2017
 - Maybe 2019

Brazos River Authority System			
Top of Conservation (full)	N/A ⁴	1,883,761	N/A ⁴
Stage 1 Drought Watch	N/A ⁴	1,514,536	N/A ⁴
Stage 2 Drought Warning	N/A ⁴	1,140,639	N/A ⁴
Stage 3 Drought Emergency	N/A ⁴	766,741	N/A ⁴
Stage 4 Pro-rata Curtailment	N/A ⁴	413,416	N/A ⁴

- 4 Drought Stages based on Combined Storage

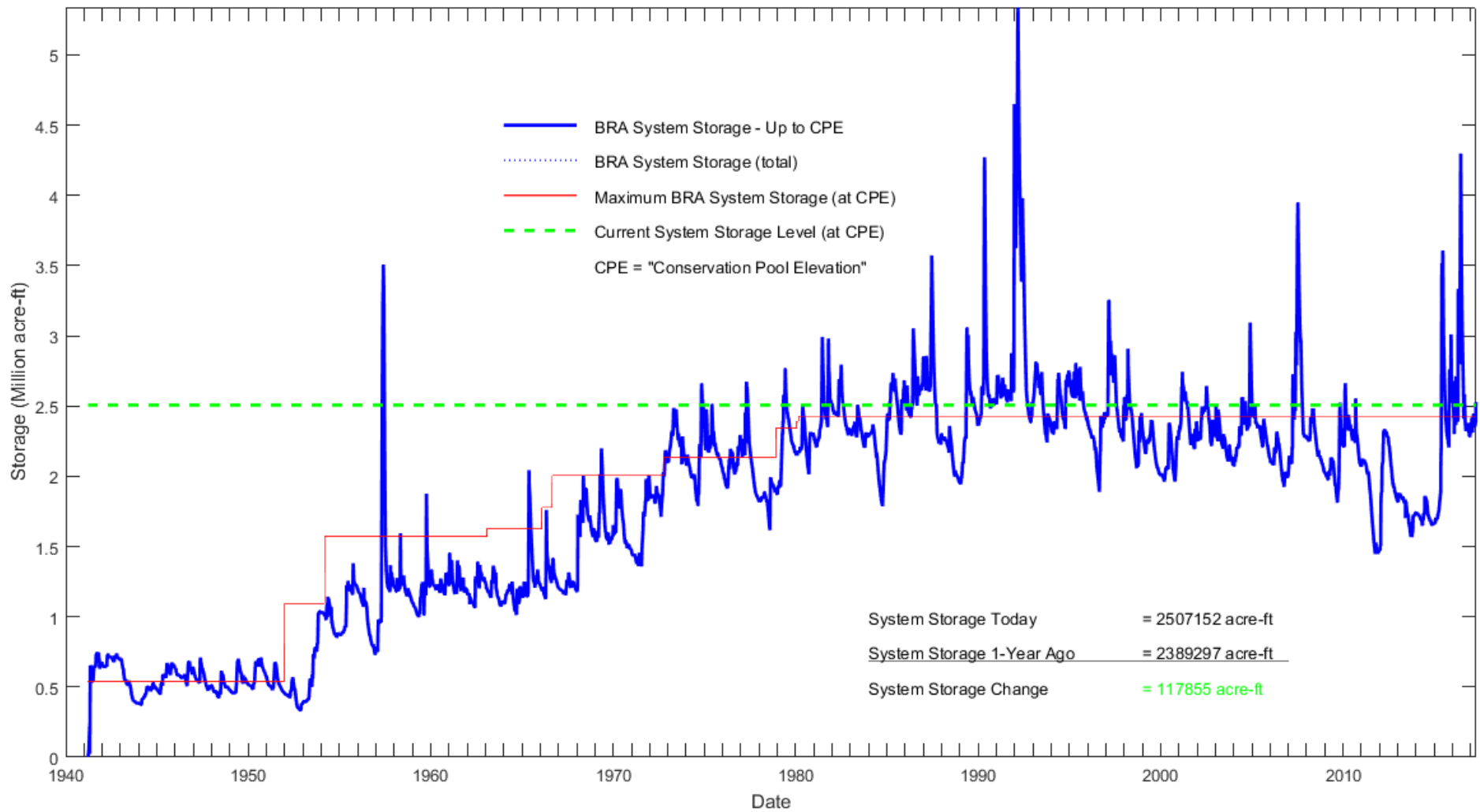
Typical Wording:

*For a reservoir, group of reservoirs, or the entire BRA System when the combined storage of the BRA System is below the Stage 2 System Storage Trigger (Table 1) and **reasonable estimates of current annual demands**, coupled with **inflows and evaporation** representative of the **drought of record**, indicate that the combined system storage could be reduced to the Stage 3 System Storage Trigger or less **during the next 12 months**.*

Implies BRA has a predictive model – *water balance likely*

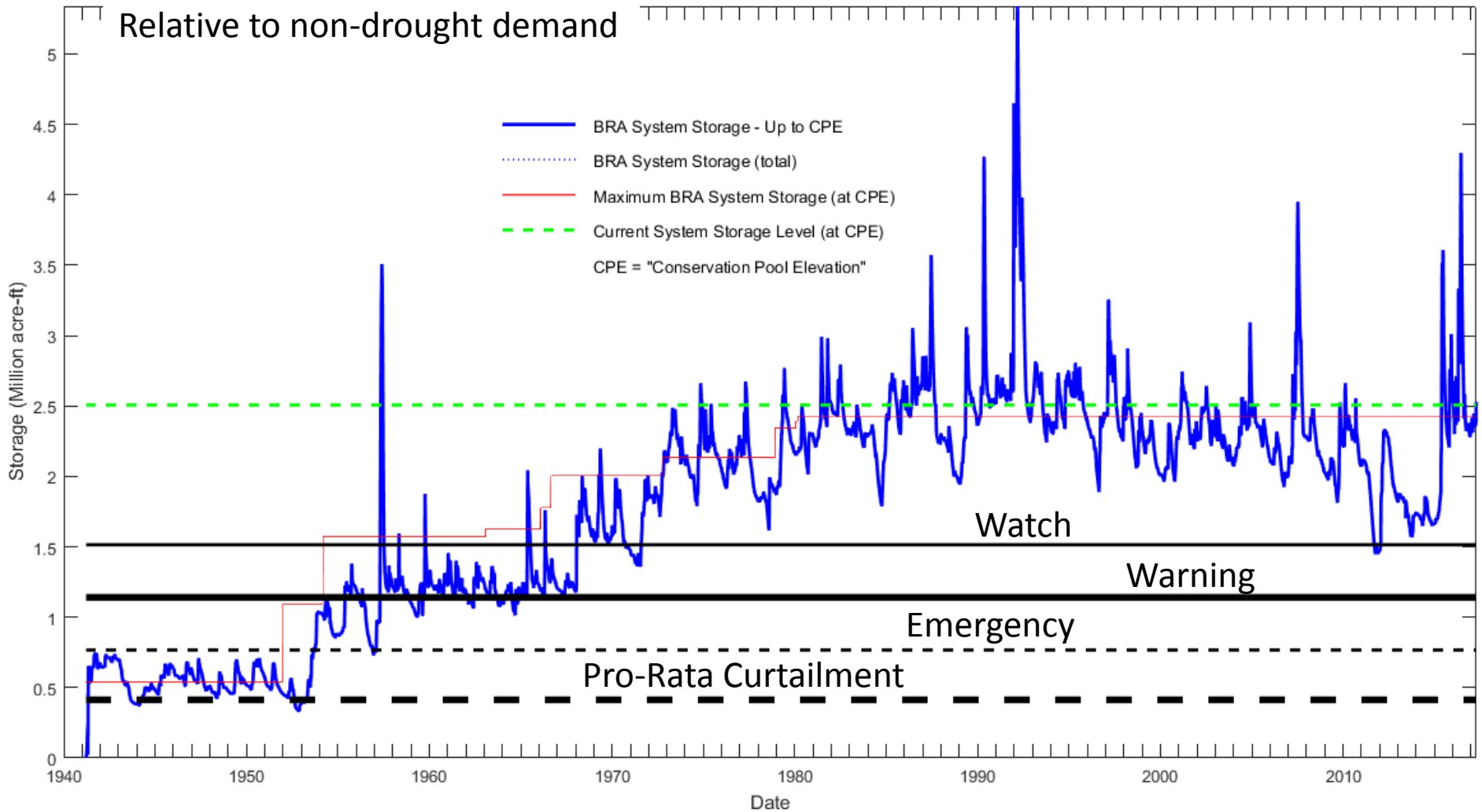
- *Re-purpose model to use in Dashboard Predictions*

BRA System – Historical Storage



BRA System – Historical Storage

Goals: % Reduction in Demands
Relative to non-drought demand



GCWA DCP

Similar to BRA's DCP – Trigger Based

- Demand Reduction Targets (Voluntary → Mandatory)
- GCWA GM has much latitude on implementing plan

- GCWA Triggers:
 - System demand exceeds **X**% of deliverable capacity for 3 days
 - GM Decides conditions warrant particular drought stage

- Terms:
 - Pro-Rata reductions in demand to affected customers
 - No prioritization
 - Variances allowed by request

**What is
good?
Bad?**

GCWA Customer DCPs

From 1/12/2017 Meeting:

- “New GCWA DCP must be consistent with current customer DCPs”

**What is
good?
Bad?**

Customer DCP's I have (and will review)

- Bacliff MUD
- Bayview MUD
- City of Galveston
- City of Hitchcock
- City of La Marque
- City of League City
- City of Texas City
- GC FWD #6 (Tiki Island)
- GC Mud #12 (Bayou Vista)
- GC WCID #1 (Dickinson)
- GC WCID #8 (Santa Fe)
- GC WCID #12 (Kemah)
- San Leon MUD

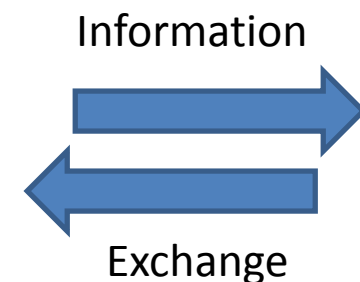
From City of Galveston DCP:

Stress Public Education Need:

- 1) The water management condition is real
- 2) Reductions in water demand are necessary.
- 3) The adopted measures realistically correspond to the severity of the situation.
- 4) All Customers share the inconvenience during water shortages.
- 5) The City of Galveston is effectively managing the existing water supply.

Drought Task Force – Future Meetings

- **Working Meetings** = No lunch, but snacks likely → At GCWA facility or **online**
 - July 2017: Date & Time TBD
 - Discuss Drought Monitoring & Vulnerability – **Preliminary Dashboard**
 - Get input on water data, GW Capabilities
 - Future meetings will be limited to 90 minutes
 - We do a “show & tell”
 - We listen to **YOU**
 - Task Force Roles:
 - Guide the engineering/planning process
 - Evaluate proposed solutions & provide feedback
 - Provide local knowledge & data to support project





LREWater, LLC
a Leonard Rice Engineers Company

Jordan Furnans, PhD, PE, PG, CFM
Project Manager – GCWA US BoR DCP Update

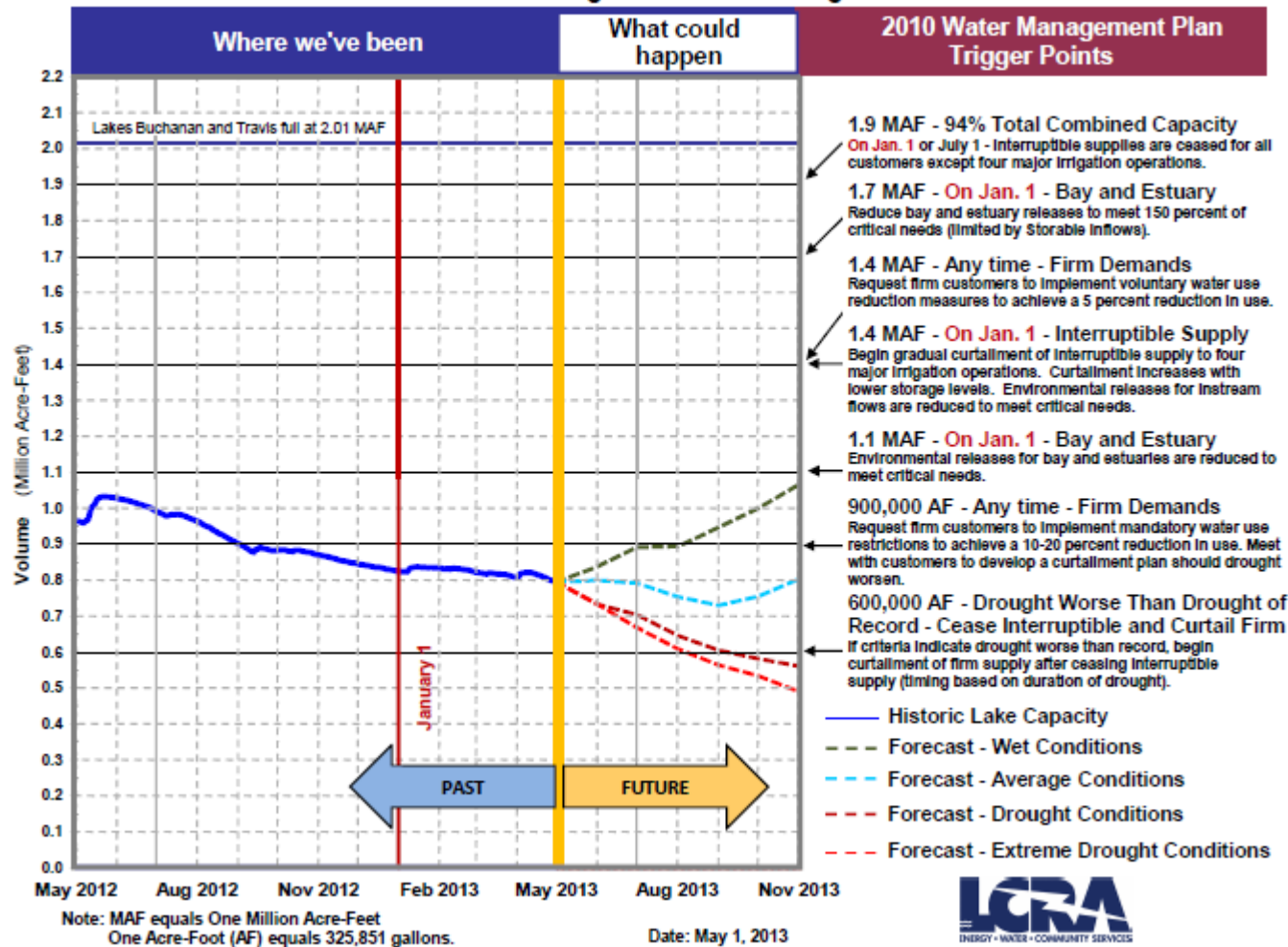
512-736-6485

Jordan.Furnans@LREWater.com

1101 Satellite View #301 – Round Rock, TX 78665

Use Established & New Ideas

- LCRA “Look Ahead” Test

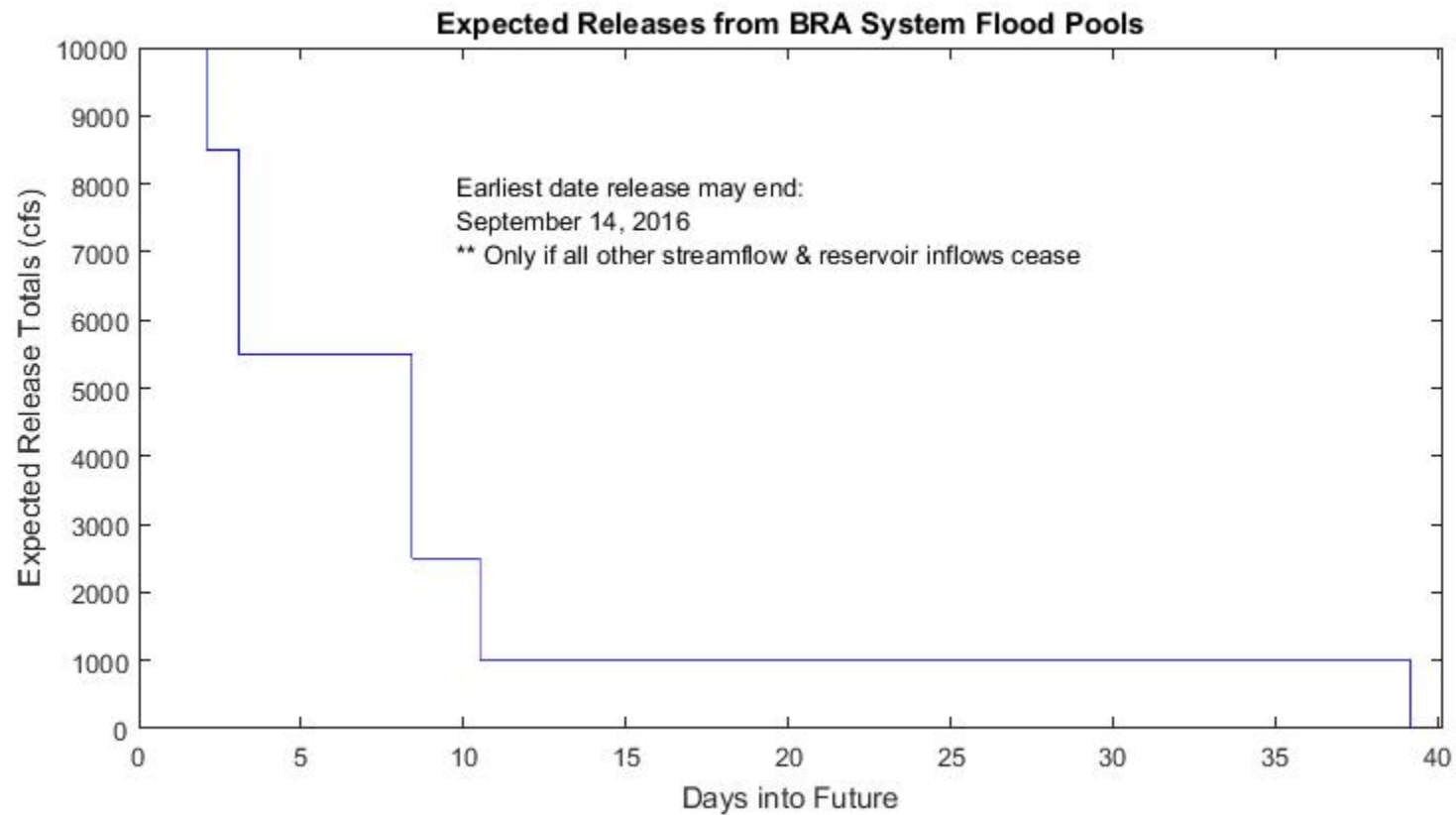


Apply to Brazos
Streamflow
Lake Storage

Water Usage Patterns
Smart Analysis

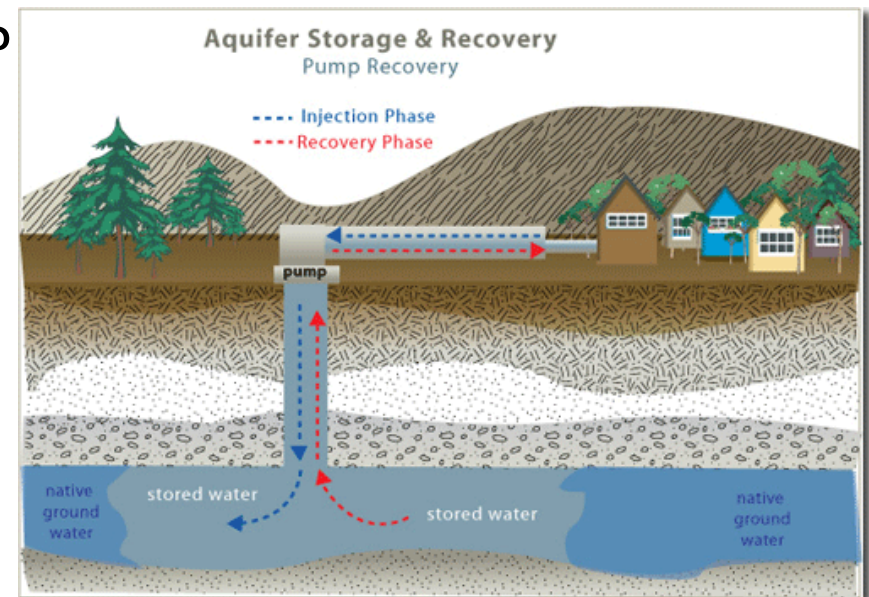


Sample Dashboard Analysis of Data



Conjunctive Use – SW & GW

- Idea = Use local groundwater when surface water is scarce
 - Use Existing or additional wells
 - Pumping subject to *subsidence district rules*
- Questions to answer:
 - How much pumping could be achieved?
 - Are existing wells operational?
 - Infrastructure Needs?
 - Permit Needs?
 - Other Needs?
 - Is ASR of benefit?



*Potential Investigation of Upstream GW usage
Building on Ongoing & Completed GCWA Projects*

Water Loss Monitoring

- Gain Loss Studies:
 - **GCWA loses 12-25% of Brazos River Water**
- Water distribution to customers:
 - 2016 Data: 5.74% Losses (2,025 acre-ft) From Mackey Plant
 - 2015 Data: 4.34% Losses (1,487 acre-ft) From Mackey Plant
- Develop & Implement Monitoring Program
 - Locate & Quantify Losses
 - GCWA will fix them – Prioritized List
 - Monitor for illegal diversions
 - Measure/Model/Estimate Stormwater Inflow
- Recommend additional gauges/monitoring locations
 - Water Level Trackers
 - In-canal storage & Optimization

Drought Task Force

- Drought Contingency Planning with US BoR
 - Large Stakeholder Component needed
 - Need to form a “Drought Task Force”
 - Will advise on project
 - Will “approve” project components
 - Comprised of GCWA customers, stakeholders, officials
 - Multiple Meetings – Quarterly (8 more)
 - Last Meeting – Public Meeting
 - Proposal Supporters:
 - San Leon MUD
 - Galveston County MUD #12
 - Bayview MUD
 - City of League City

Stakeholders Identified To Date

GCWA Drought Contingency Plan Update - Participants							
Entity	Level			Primary Interest			
	Commit	Interest	Expected	MUN	IND	IRR	ENV
San Leon MUD	X			X			
Galveston County Mud #12	X			X			
Bayview MUD	X			X			
City of League City	X			X			
City of Missouri City		X		X			
City of Sugarland		X		X			
Ascend Performance Materials		X			X		
Marathon Petroleum		X			X		
INEOS		X			X		
Dow Chemical		X			X		
NRG Energy		X			X		
Brazos River Authority			X	X	X	X	
Lower Brazos River Coalition		X		X	X	X	X
Harris-Galveston Subsidence District			X	X	X	X	
Texas Farm Bureau			X		X	X	
Texas Parks And Wildlife			X				X
Texas Water Development Board			X	X	X	X	X