LCRA WATER MANAGEMENT PLAN

Participant Meeting
July 12, 2018
Agenda

• Timeline
• Updates to WMP model input
  - Water demands
  - Comments received
  - Arbuckle Reservoir
  - Amended Garwood water right
• WMP overview
• Model results
• Discussion
Timeline

- May 21 – First participant meeting
- July 12 – Second participant meeting
- Aug. 10 – Third participant meeting
- Sept. 6 – Fourth participant meeting
- October/November – Draft WMP discussed with LCRA Board
- December – WMP before LCRA Board for approval
- Early 2019 – Plan submitted to TCEQ
LCRA’s Water Management Plan

• Governs LCRA’s operation of lakes Buchanan and Travis to supply water to users throughout the lower Colorado River basin

• Allows for supply of interruptible water provided we continue to meet the needs of our firm customers

• Helps meet the environmental needs of the river and bay

• The basic objectives:
  - Meet firm demands
  - Maintain minimum combined storage
WMP MODEL INPUT

- Hydrology
- Water demands
- Arbuckle Reservoir
- Amended Garwood water right
Water Demands – Methodology Recap

• Based on Region K projections and recent use
• Expand use of weather variation
• Use highest projected demands through 2025
Comments Received

• Eight entities submitted comments
• About 45 total comments and questions
• 15 comments on water demands
Response to Comments

• Preparing written response for all comments
  - Will post on lcra.org
• Will discuss comments on water demands today
• Will continue to consider participant input throughout the update process
## Comments Received

**Regarding level of firm demands**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Use 2030 demands reflecting a 10-year horizon</td>
<td>WMP is updated as conditions change, including demands; 2025 demands are protective</td>
</tr>
<tr>
<td>2 Adjust demand volumes for City of Austin</td>
<td>Proposed demands are reasonable and protective</td>
</tr>
<tr>
<td>3 Municipal and industrial demands may be over-estimated; need to account for conservation savings</td>
<td>Proposed 2025 demands are reasonable and protective</td>
</tr>
</tbody>
</table>
### Comments Received

**Regarding level of firm demands**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Proposed approach is protective of firm demands</td>
</tr>
<tr>
<td>5</td>
<td>Projected demands are consistent with methods and sources</td>
</tr>
<tr>
<td>6</td>
<td>Demands revised to match Region K</td>
</tr>
</tbody>
</table>

- **4**: Use “most protective” approach to estimate firm demands
- **5**: Demands for Cedar Park and domestic use on the Highland Lakes appear understated
- **6**: Revise Leander’s demands to Region K 2021 projections
## Comments Received

*Regarding water conservation*

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
</table>
| 7       | Provide how conservation efforts affect water suppliers and WMP model  
  Projections include plumbing-fixture conservation |
## Comments Received

*Information requests and other comments*

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Change weather variables used to categorize high-demand years</td>
</tr>
<tr>
<td>9</td>
<td>Explain objective for using weather-varied demands</td>
</tr>
<tr>
<td>10</td>
<td>Provide table comparing demands from 2015 WMP, proposed updated demands, and Region K demands</td>
</tr>
<tr>
<td>11</td>
<td>Where are potential emergency hydro releases accounted for</td>
</tr>
</tbody>
</table>
# Comments Received

*Information requests and other comments*

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Projected domestic use demand is 5,100 a-f/yr; 4,574 a-f/yr currently contracted</td>
</tr>
<tr>
<td>13</td>
<td>2011 to 2017 data used; draft technical paper is being corrected</td>
</tr>
<tr>
<td>14</td>
<td>Actual high-use years are used for projecting high-use years at all plants</td>
</tr>
<tr>
<td>15</td>
<td>Instream flow and bay criteria result in a varying water needs; stored water needed is reported in model results</td>
</tr>
</tbody>
</table>
### Preliminary Projected 2025 Demands (acre-feet/year)

<table>
<thead>
<tr>
<th></th>
<th>Normal/Average</th>
<th>High/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Municipal/Manufacturing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Austin¹</td>
<td>167,300*</td>
<td>215,900</td>
</tr>
<tr>
<td>Other²</td>
<td>109,000*</td>
<td>130,200*</td>
</tr>
<tr>
<td><strong>Steam-electric³</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCRA power plants</td>
<td>13,100*</td>
<td>19,700</td>
</tr>
<tr>
<td>COA power plants</td>
<td>11,900*</td>
<td>18,600</td>
</tr>
<tr>
<td>STP</td>
<td>39,400</td>
<td>39,400</td>
</tr>
<tr>
<td>Bastrop Energy Partners</td>
<td>2,300</td>
<td>2,300</td>
</tr>
<tr>
<td><strong>Agriculture⁴</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lakeside</td>
<td>114,000</td>
<td>135,300</td>
</tr>
<tr>
<td>Garwood</td>
<td>88,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Pierce Ranch</td>
<td>27,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>139,000</td>
<td>156,700</td>
</tr>
</tbody>
</table>

¹ Average-use year projections estimated by City of Austin Water Forward Task Force. High-use year projections estimated by Region K.

² High-use year projected demands based on Region K. For entities not reported in Region K, high-use projected demands are based on use since 2010. Average-use year projections estimated from ratio of average to high use in recent years.

³ Max-use year based on 2011. Weather variation applied to FPP and Decker power plant, and evaporation from STP cooling reservoir.

⁴ Based on Region K projected demands. Weather variation applied to all operations.

*Updated since May 21 meeting presentation.
Additional WMP Model Input

• Arbuckle Reservoir
  - Expected to begin operating in early 2019
• Amended Garwood water right
  - Issued in 2018
Modeled Operation of Arbuckle Reservoir

- Filled from river diversions under Gulf Coast water right
- Used before Highland Lakes stored water
- Supplies water for firm and interruptible customers
- Stores “ordered-not-diverted” water
- Helps meet bay inflow obligation
- In curtailment years, 25 percent of stored water available only for agricultural irrigation
Modeled Use of Amended Garwood Water Right

- Adds diversion locations upstream
- Run-of-river water can be used for some firm customers; reduces use of stored water from Highland Lakes
- Contract commitments to Garwood farmers remain
2015 WATER MANAGEMENT PLAN
Water Management Plan Overview

• The basic WMP framework:
  - Three water supply conditions – Normal, Less Severe Drought and Extraordinary Drought
  - Two evaluation dates for interruptible water availability for agriculture
  - Look-ahead tests
  - Environmental flow criteria
Normal Water Supply Condition

• Default water supply condition: Normal

• Interruptible stored water available:
  - Up to 202,000 acre-feet in first irrigation season
  - Up to 76,500 acre-feet in second irrigation season
Less Severe Drought Water Supply Condition

- Criteria for entering Less Severe Drought Water Supply Condition:
  - Combined storage ≤ 1.6 million acre-feet on evaluation date and three-month inflow ≤ 50,000 acre-feet
  - Combined storage ≤ 1.4 million acre-feet on evaluation date and three-month inflow total ≤ 33rd percentile

- Interruptible stored water available:
  - Up to 155,000 acre-feet in first irrigation season.
  - Up to 55,000 acre-feet in second irrigation season
Extraordinary Drought Water Supply Condition

• Criteria for entering:
  - Combined storage below 1.3 million acre-feet on evaluation date
  - Been 24 months since lakes were last full
  - Long-term inflows equal or worse than 1950s drought

• No interruptible stored water available to Gulf Coast, Lakeside and Pierce Ranch irrigation operations
Look-ahead Test

• If on March 1 or July 1 projections indicate:
  - Storage could drop below 900,000 acre-feet in upcoming crop season
  OR
  - Storage could drop below 600,000 acre-feet within 12 months

• Then no interruptible stored water available to Gulf Coast, Lakeside and Pierce Ranch irrigation operations
Environmental Flows

• Two evaluation dates for environmental flows
• Instream flows levels:
  - Base Average, Base Dry and Subsistence
• Matagorda Bay inflows:
  - Monthly Threshold value
  - OP 1-4
## Instream Flows

<table>
<thead>
<tr>
<th>Combined Storage on Evaluation Date</th>
<th>Instream Flow Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 1.96 million acre-feet</td>
<td>Base Average</td>
</tr>
<tr>
<td>Between 1.90 and 1.96 million acre-feet</td>
<td>Base Dry</td>
</tr>
<tr>
<td>Less than 1.90 million acre-feet</td>
<td>Subsistence</td>
</tr>
</tbody>
</table>
# Freshwater Inflows to Matagorda Bay

<table>
<thead>
<tr>
<th>Combined Storage on Evaluation Date</th>
<th>Freshwater Inflow Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 1.95 million acre-feet</td>
<td>OP-4</td>
</tr>
<tr>
<td>1.5 to 1.95 million acre-feet</td>
<td>OP-3</td>
</tr>
<tr>
<td>1.3 to 1.5 million acre-feet</td>
<td>OP-2</td>
</tr>
<tr>
<td>1.0 to 1.3 million acre-feet</td>
<td>OP-1</td>
</tr>
<tr>
<td>At all times</td>
<td>Threshold</td>
</tr>
</tbody>
</table>
PRELIMINARY APPROACH TO THE NEXT WATER MANAGEMENT PLAN
Preliminary Extraordinary Drought Criteria Change

- Reduce drought duration requirement to at least 18 months since lakes last full
Preliminary Ag Supply Changes

• Reduce the amount of interruptible stored water available

• Maximum first season interruptible stored water: about 175,000 acre-feet

• Maximum second season interruptible stored water: about 60,000 acre-feet

• Corresponding changes to curtailment curves
Preliminary Environmental Flow Changes

• Balance large releases of storable inflows

• Limit Wharton obligation when storage is below 900,000 acre-feet

• Adjust Base-Dry to Subsistence trigger from 1.9 MAF to 1.8 MAF

• Add a third evaluation date (Nov. 1)
Preliminary Environmental Flow Changes

• Use Arbuckle Reservoir to meet bay inflow obligation

• Include a bypass at Arbuckle Reservoir to help meet bay Threshold

• Help meet Threshold with releases from Arbuckle Reservoir
REVIEW OF WAM MODEL
Water Availability Model (WAM)

What is a WAM?

• Computer-based mathematical model of the river system that incorporates:
  - Hydrologic elements (river flows, evaporation)
  - Diversions and return flows
  - Water rights (prior appropriation system)
  - Reservoirs

• Uses a monthly time step

• Based on the TCEQ WAM for the Colorado River basin
What the WAM does

Provides estimates of the amount of water that would be in the river and lakes for a specified set of physical and management conditions had those conditions been in place throughout the period of record.
Model Implementation

• On monthly time step, model calculates:
  - River flows
  - Diversions to meet water rights and contracts
  - Highland Lakes combined storage
  - Environmental flows

• On evaluation dates, model assesses:
  - Combined storage
  - Highland Lakes inflows
  - Look-ahead test
  - Environmental flow conditions

• Interruptible water allocated
  - First irrigation season: March through July
  - Second irrigation season: August through October
WAM Process

Input:
• Hydrology
• Demands
• WMP conditions

Run WAM

Reams of output

Results Summary

Monthly Output
PRELIMINARY MODEL RESULTS
Results Summary – Preliminary Results

Information presented in the Results Summary:

- Water demands
- Reports summary metrics
  - Firm customer demands met
  - Lake levels
  - Interruptible water cutoffs
  - Bay and estuary (B&E) inflows
- Period of Record (POR) results
- Drought of Record (DOR) results
- Additional details (same categories)
- Instream flows
- Information specific to each irrigation operation
Monthly Output – Preliminary Results

- Water supply condition
  - White – Normal
  - Blue – Less Severe Drought
  - Orange – Extraordinary Drought
  - Purple – Cutoff caused by Look-ahead Test
- Combined storage
- Cumulative inflows
  - Since lakes last full
  - Drought of Record inflows
- Monthly counter since full
- 3-month cumulative inflow
- Amount of interruptible stored water remaining
Results Summary – Preliminary Results

Switch over to the .pdf of the summary output.
Monthly Output – Preliminary Results

Switch back from output.
Next Steps

• Comment period open until July 31
  - Submit comments to LCRAWMP@lcra.org
• Aug. 10 – Third participant meeting
  - Discuss comments