Austin WATER | WATER FORWARD
INTEGRATED WATER RESOURCE PLAN

Austin Integrated Water Resource Planning Community Task Force

Packet Index

February 7, 2017

Austin Integrated Water Resource Planning Community Task Force
February 7, 2017 – 6:00 p.m.
Waller Creek Center, Room 104
625 East 10th Street
Austin, Texas 78701

For more information go to:
Austin Integrated Water Resource Planning Community Task Force

AGENDA

Voting Members:

Sharlene Leurig - Chair	Marianne Dwight	Sarah Richards
Jennifer Walker – Vice Chair	Diane Kennedy	Lauren Ross
Todd Bartee	Perry Lorenz	Kate Zerrenner
Clint Dawson	Bill Moriarty	

Ex Officio Non-Voting Members:
Austin Water: Greg Meszaros
Austin Energy: Kathleen Garrett
Austin Resource Recovery: Sam Angoori
Neighborhood Housing and Community Development: Rebecca Giello
Office of Innovation: Kerry O'Connor
Office of Sustainability: Lucia Athens
Parks and Recreation: Sara Hensley
Watershed Protection: Mike Personett

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1. **CALL TO ORDER – February 7, 2017, 6:00 p.m.**

2. **CITIZEN COMMUNICATION**

   The first 10 speakers signed up prior to the meeting being called to order will each be allowed a three-minute allotment to address their concerns regarding items not posted on the agenda.

3. **APPROVAL OF MEETING MINUTES**
   a. Approval of the meeting minutes from the January 31, 2017 Task Force meeting (5 minutes)

4. STAFF BRIEFINGS, PRESENTATIONS, AND OR REPORTS

a. Recap of near-term schedule and deadlines – City Staff (10 minutes)
    i. Task Force Discussion and Input
b. Preliminary water needs identification presentation – City Staff and Consultant (50 minutes)
    i. Task Force Discussion and Input
c. Demand Management and Supply Options Discussion – City Staff and Consultant (50 minutes)
    i. Task Force Discussion and Input

5. SUBCOMMITTEE REPORTS

6. VOTING ITEMS FROM TASK FORCE

7. FUTURE AGENDA ITEMS

8. ADJOURN

Note: Agenda item sequence and time durations noted above are subject to change.

The City of Austin is committed to compliance with the American with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request. Meeting locations are planned with wheelchair access. If requiring Sign Language Interpreters or alternative formats, please give notice at least 2 days (48 hours) before the meeting date. Please call Austin Integrated Water Resource Planning Community Task Force, at 512-972-0194, for additional information; TTY users route through Relay Texas at 711.

For more information on the Austin Integrated Water Resource Planning Community Task Force, please contact Marisa Flores Gonzalez at 512-972-0194.

MINUTES

The *Austin Integrated Water Resource Planning Community Task Force* convened in a regular meeting on January 31, 2017 at Waller Creek Center, Conference Rm 900 Large, 625 E 10th Street, in Austin, Texas.

Members in Attendance:

Sharlene Leurig - Chair	Marianne Dwight	Lauren Ross
Jennifer Walker – Vice Chair	Diane Kennedy	
Todd Bartee	Bill Moriarty	

Ex-Officio Members in Attendance:

Staff in Attendance:
Kevin Critendon, Daryl Slusher, Teresa Lutes, Joe Smith, Marisa Flores Gonzalez, Bruk Berhanu, Mark Jordan, Ginny Guerrero, Prachi Patel, Katherine Jashinski, Ryan Robinson, Jadell Hines, Ryan Robinson

Additional Attendees:
John Burke, Ron Anderson

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1. CALL TO ORDER
Sharlene Leurig, Chair, called the meeting to order at 10:21 a.m.

2. CITIZEN COMMUNICATION: GENERAL
None

3. APPROVAL OF MEETING MINUTES
The meeting minutes from the January 17, 2017 Austin Integrated Water Resource Planning Community Task Force regular meeting were approved on Member Walker's motion and Member Moriarty's second on a 6-0-1-3 vote with Members Lorenz, Dawson and Richards absent.

4. STAFF BRIEFINGS, PRESENTATIONS, AND/OR REPORTS

a. Water Demand Projections Overview, Including Disaggregated Demand Model Follow-Up presentation was provided by Joe Smith, P.E., Supervising Engineer, Austin Water, Ryan Robinson, City Demographer, Planning and Zoning Department, Marisa Flores Gonzalez, Senior Planner, Austin Water and Bruk Berhanu, Engineering Intern, Austin Water. This briefing was followed by a Task Force discussion including questions and answers.

b. Process Overview Follow Up by Marisa Flores Gonzalez, Senior Planner, Austin Water. This briefing was followed by a Task Force discussion including questions and answers.

5. SUBCOMMITTEE REPORTS
None

6. VOTING ITEMS FROM TASK FORCE
None

10. FUTURE AGENDA ITEMS
None

Chair Leurig adjourned the meeting at 12:12 pm.

PRESENTATION

Water Forward – Austin's Integrated Water Resource Plan

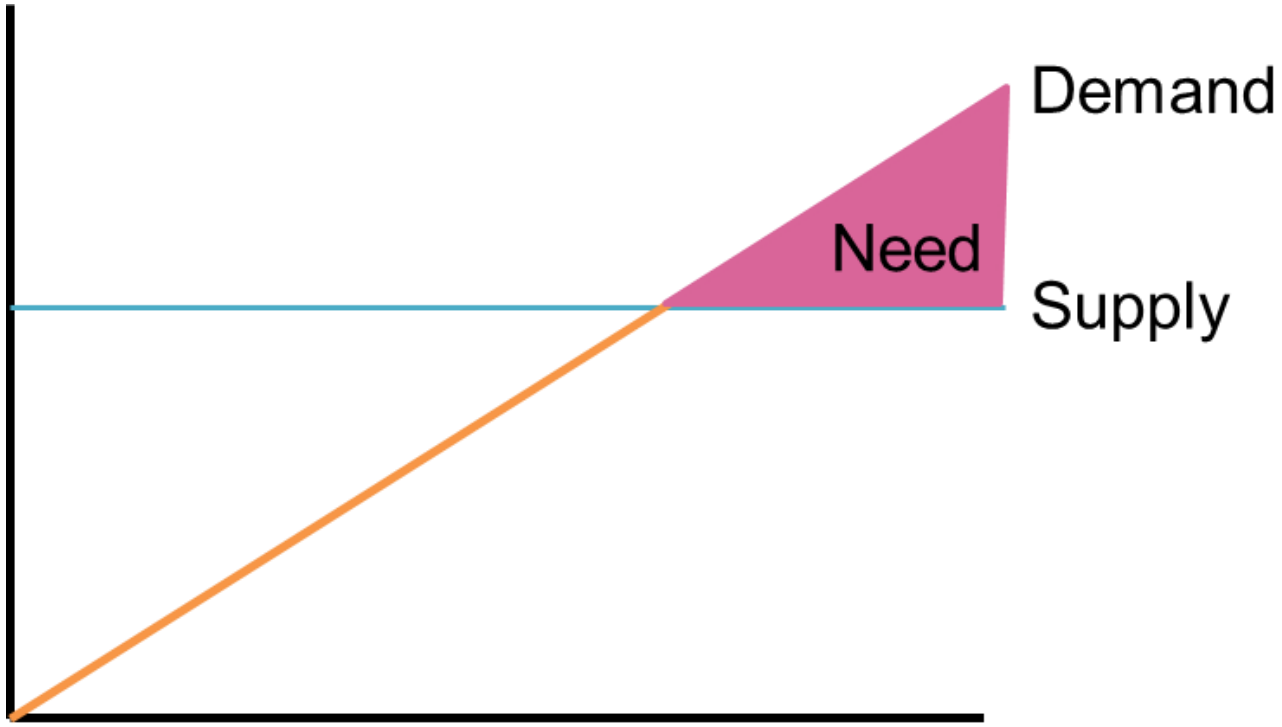
February 7, 2017

Outline

- Preliminary water needs identification
- Demand management and supply side options
- Next steps

Preliminary water needs identification

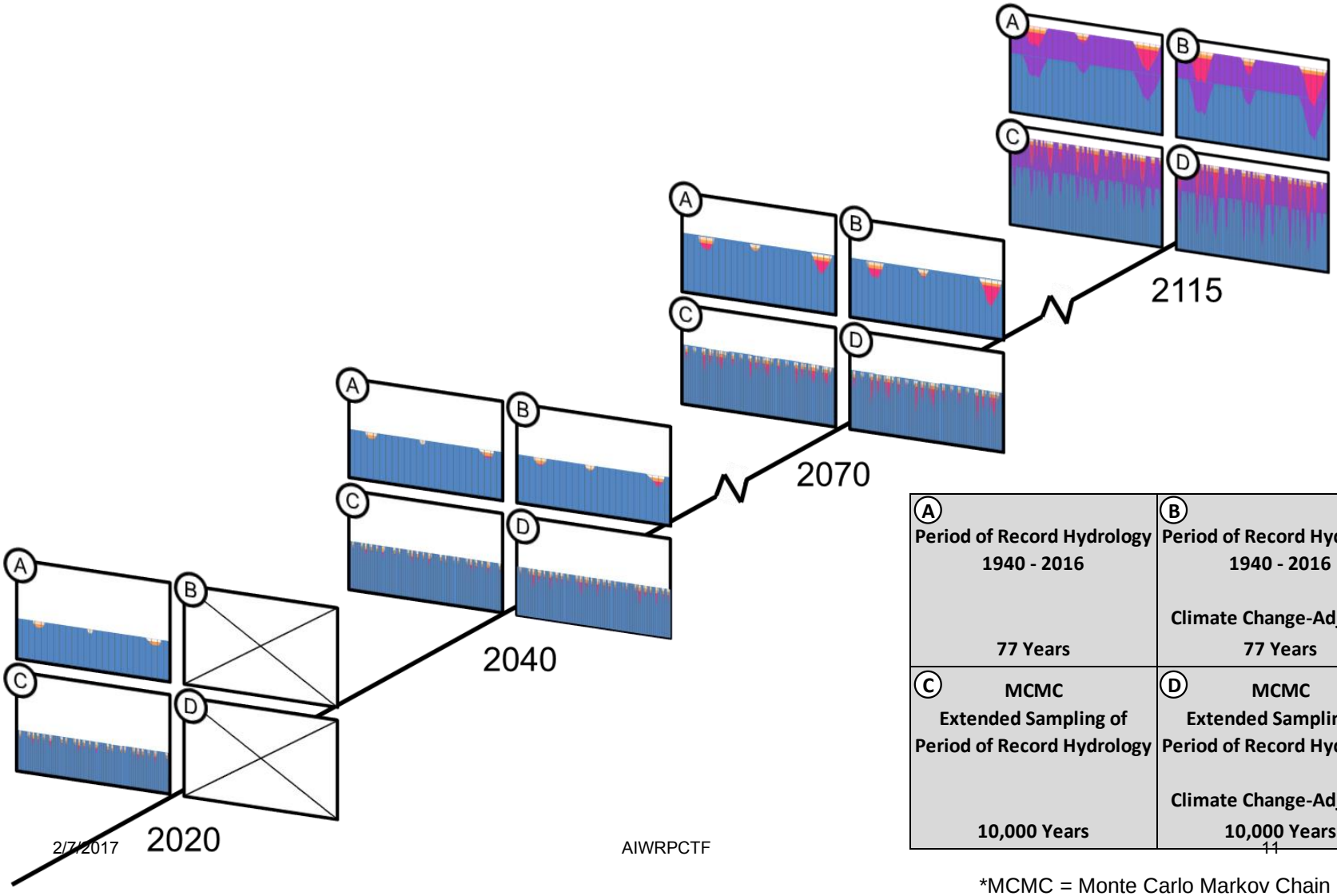
Traditional Water Planning



- Unlike traditional water planning, the IWRP is a dynamic process
- Not just planning for one number, but for a range of possible future conditions

Water Forward

Planning For Change and Uncertainties

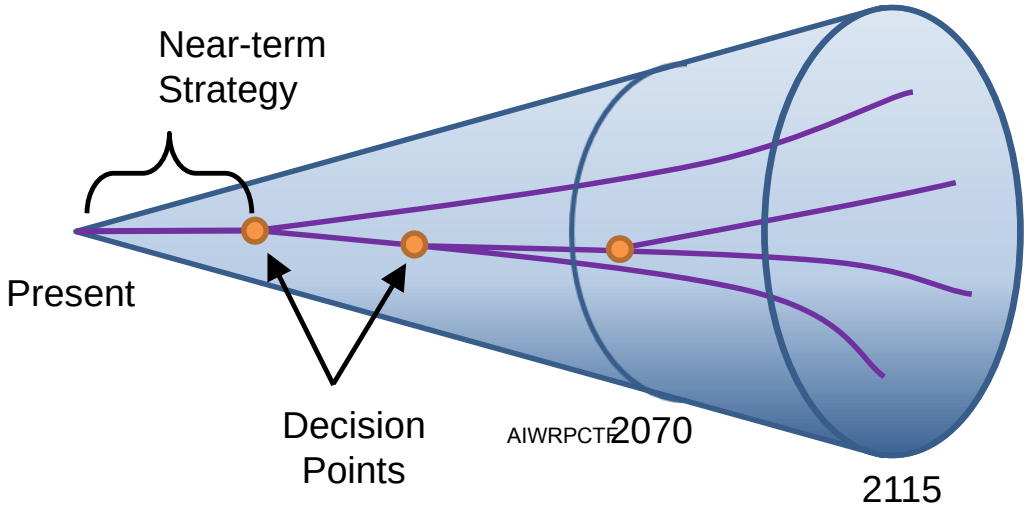


(A) Period of Record Hydrology 1940 - 2016 77 Years	(B) Period of Record Hydrology 1940 - 2016 Climate Change-Adjusted 77 Years
(C) MCMC Extended Sampling of Period of Record Hydrology 10,000 Years	(D) MCMC Extended Sampling of Period of Record Hydrology Climate Change-Adjusted 10,000 Years

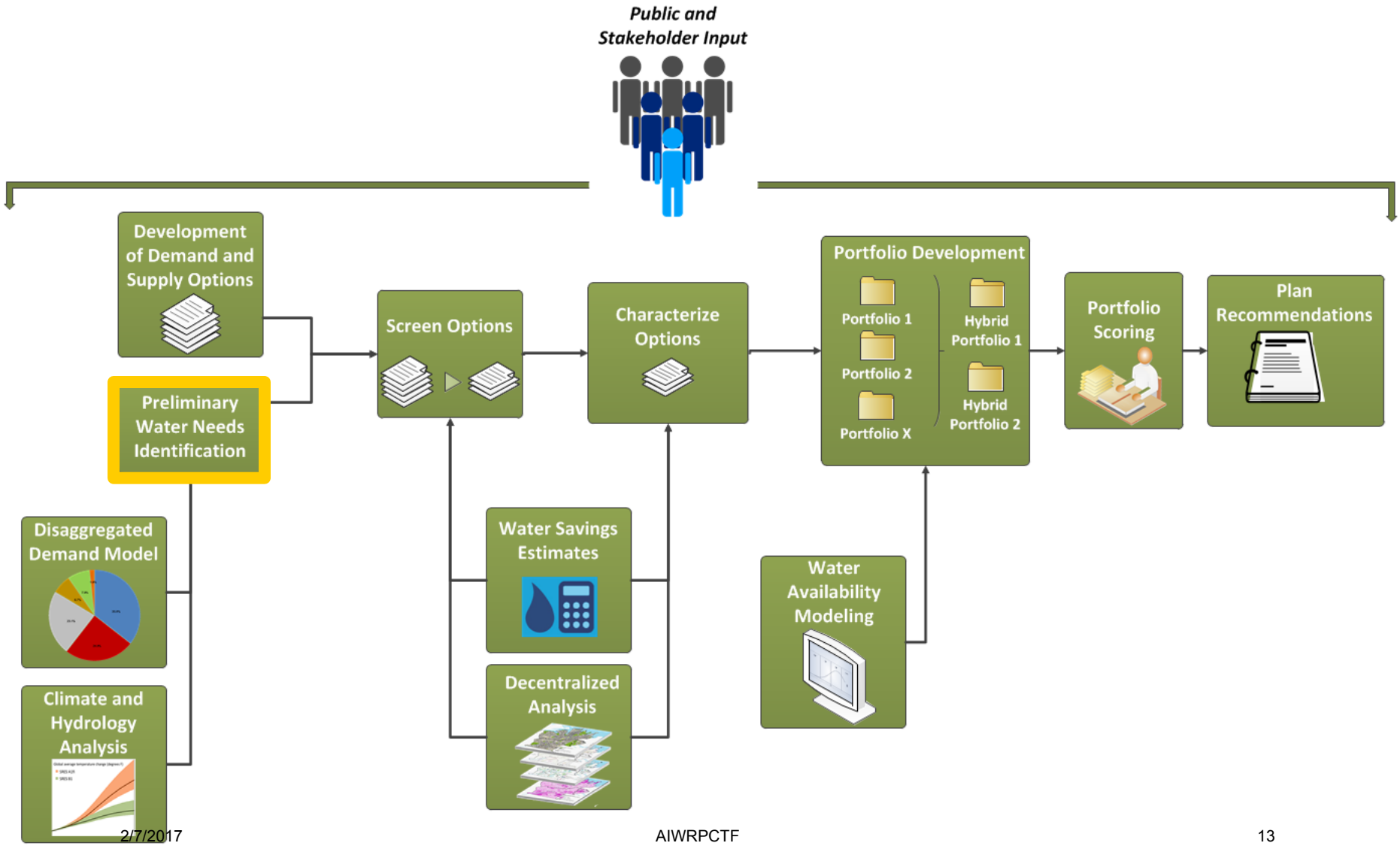
*MCMC = Monte Carlo Markov Chain

Some Key Points About Austin's Integrated Water Resource Plan

- We're implementing an adaptive management approach
- This process is about incremental changes we can make to get closer to our desired future
- The plan is anticipated to be updated on a five year cycle to allow new data to inform planning assumptions
- Future updates to the plan will allow us to build on the work we do today and learn from our actions



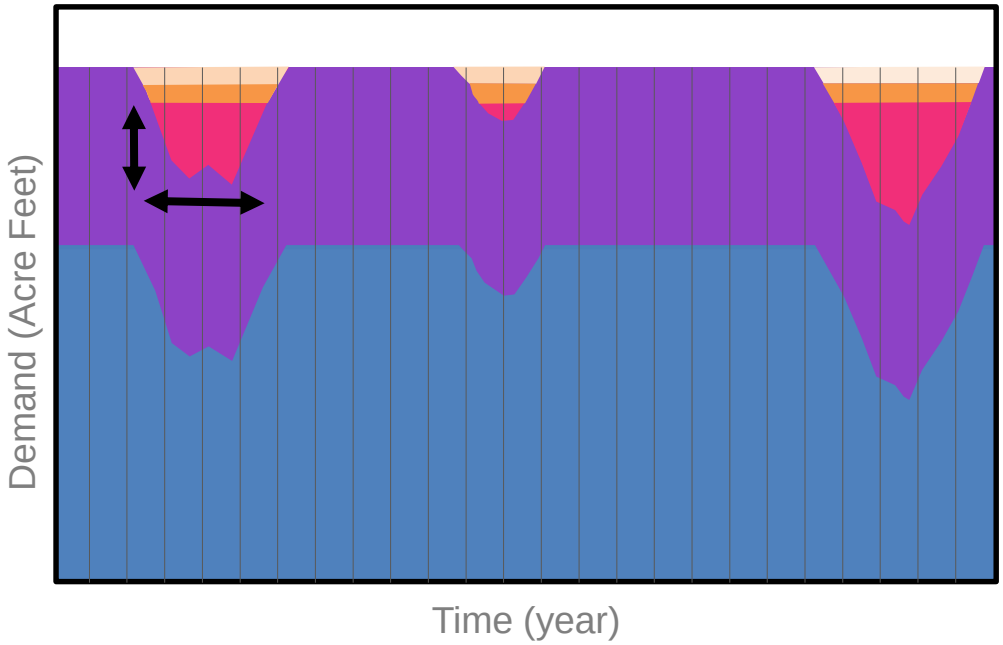
Plan Development Process



Preliminary Water Needs Identification

- **City of Austin Needs will include**
  - **Needs During Prolonged Drought** = Demand reductions from implementation of Stages 3&4
  - **Needs Above Current Contract** = Baseline demands above current 325,000 AF contract with LCRA

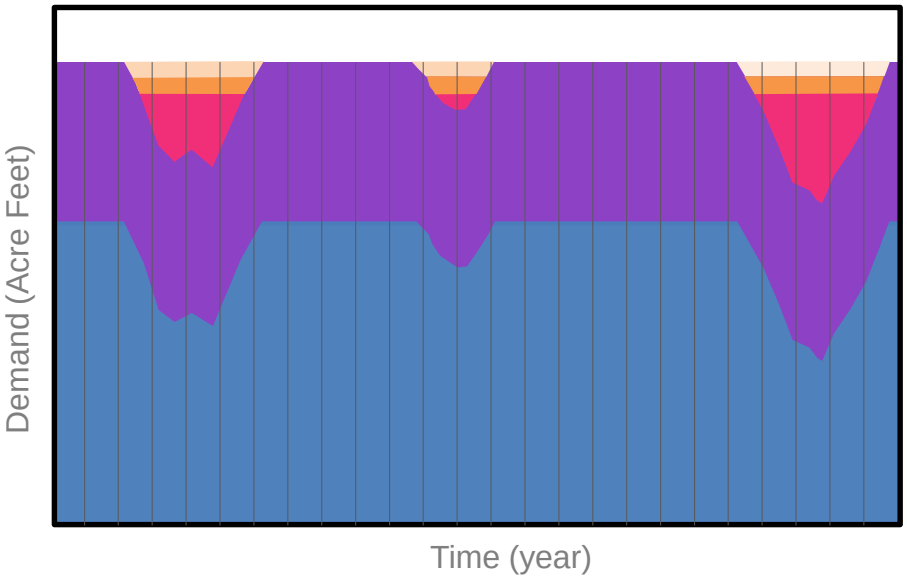
2115 Demands
Evaluated Against Period of Record Hydrology



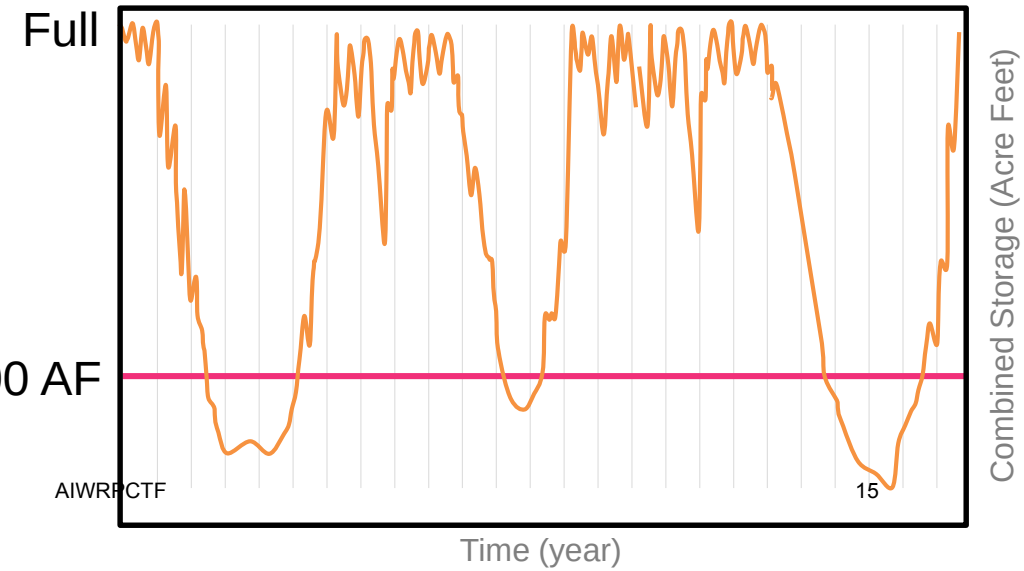
Preliminary Water Needs Identification

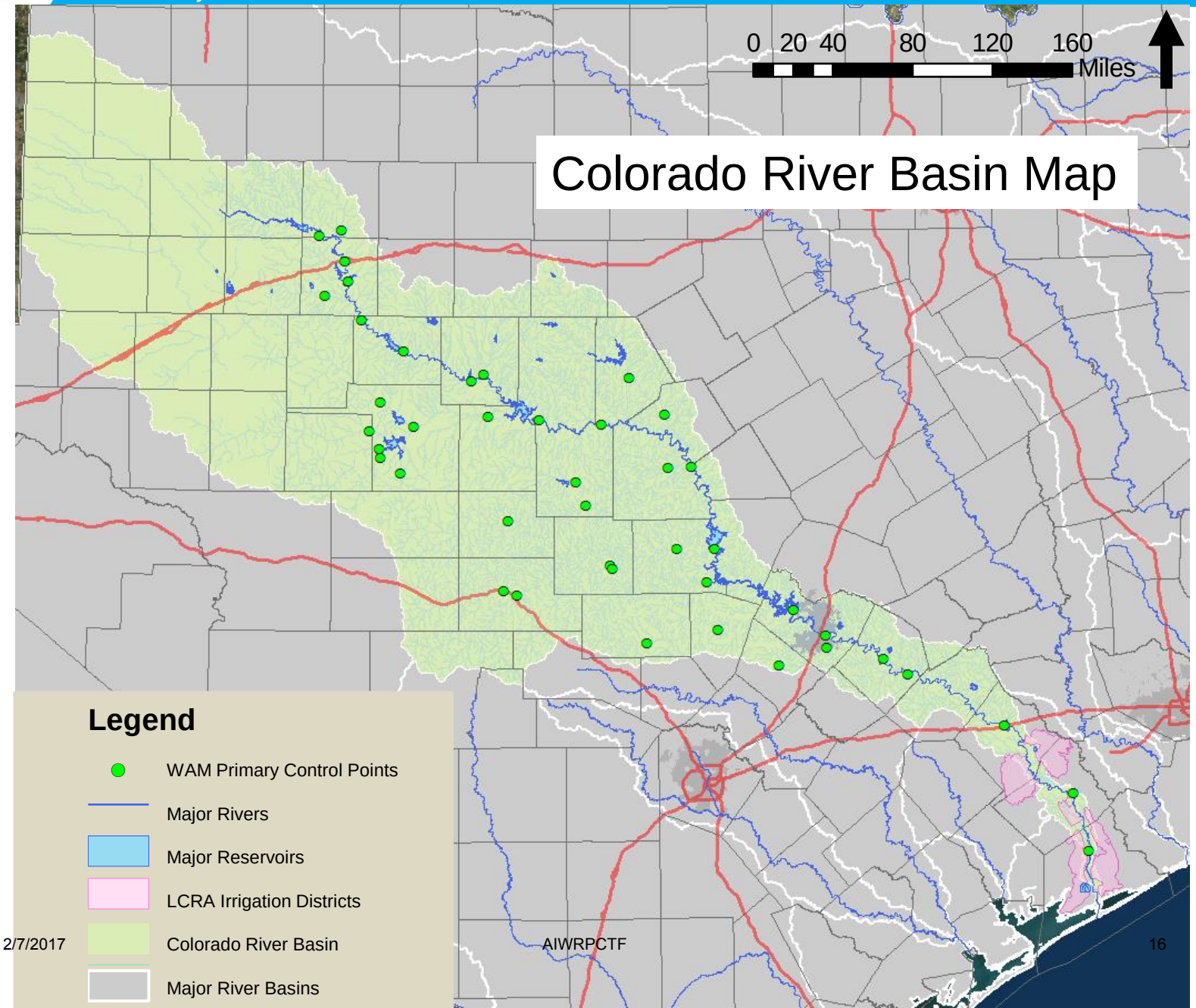
- **Regional Needs** = include periods when combined storage levels dip below emergency levels
- Future hydrologic scenarios may identify regional water needs
- Despite assumed cutbacks on the part of AW and others, reservoir levels may still go below emergency levels

2115 City of Austin Supplies versus Demand



Highland Lakes Combined Storage Levels




0 20 40 80 120 160
Miles
Colorado River Basin Map
Legend
WAM Primary Control Points
Major Rivers
Major Reservoirs
LCRA Irrigation Districts
Colorado River Basin
Major River Basins

Assumptions for "Water Forward WAM"

- Full basin simulation based on TCEQ WAM
- Monthly time step simulation
- Modifications made to better reflect lower basin water right operations
  - Water rights above OH Ivie and Brownwood simulated first (Region K cutoff assumption)
  - Assumption for reliable flows and stored water delivery losses below Highland Lakes
- Austin's municipal return flows added
- Austin and regional demands are reduced according to combined storage amounts

Assumptions for "Water Forward WAM", continued

- Demands for firm water customers set according to 2020, 2040, and 2070 estimates
  - Austin's average-year demands according to Disaggregated Demand Model
  - Regional firm demands informed by Region K projections
  - Agricultural demands according to 2015 WMP projections
- Regional demands for 2115 estimated from 2070 demands and other information
- Demands adjusted for climate change scenarios
  - Firm customer demand increases of 2%, 4%, and 6% in 2040, 2070, and 2115
  - Agricultural demands adjusted using equation incorporating evaporation and precipitation
- LCRA's Lane City off-channel reservoir in all simulations
- Agricultural irrigation demands allowed to access LCRA interruptible stored water in 2020 and 2040 in conjunction with other supplies. On-farm storage and other supplies used for agriculture in 2070 and 2115.

City of Austin Needs Summary

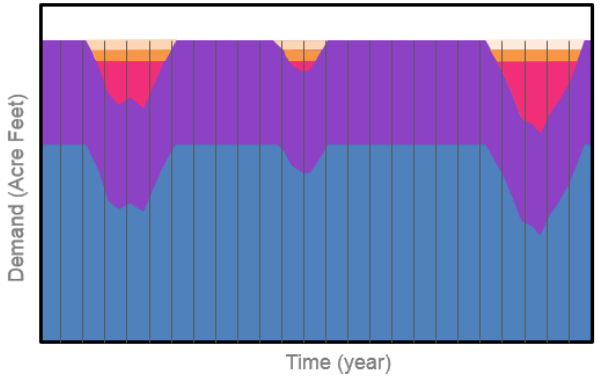
Needs During Prolonged Drought

	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft
Planning Horizon Year	C	-	-	-	-	D	-	-	-	-

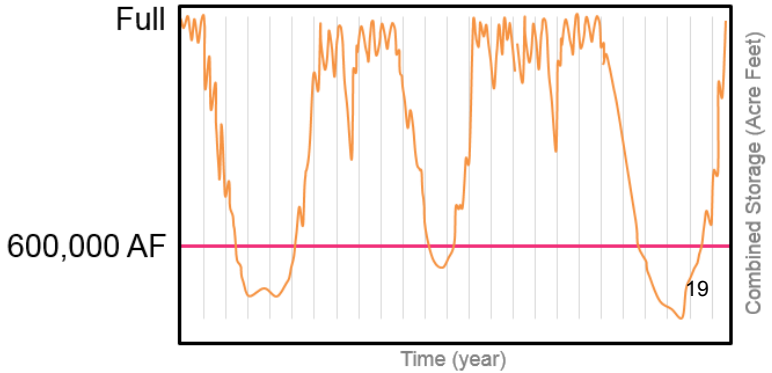
- Drought of 2007-2016 used for results reporting for POR simulations

- In a February 2015 press release LCRA announced that
  …"the Highland Lakes are now in a new 'critical period' marking the driest conditions on record, eclipsing the 1947-57 drought that until now was the worst on record for this region."

2115 City of Austin Supplies versus Demand



Highland Lakes Combined Storage Levels



2020 City of Austin Needs Summary

Needs During Prolonged Drought

	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft
A	0	0	0	0

	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft
B	No Significant Change from Period of Record			

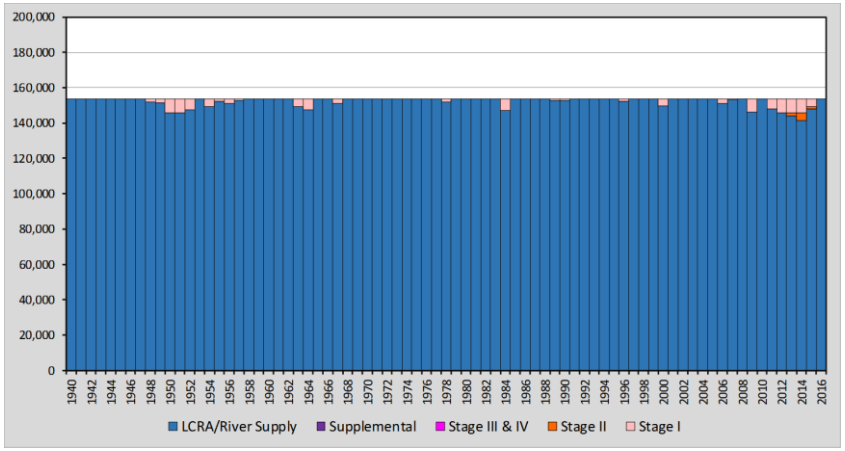
Needs above Current Contract

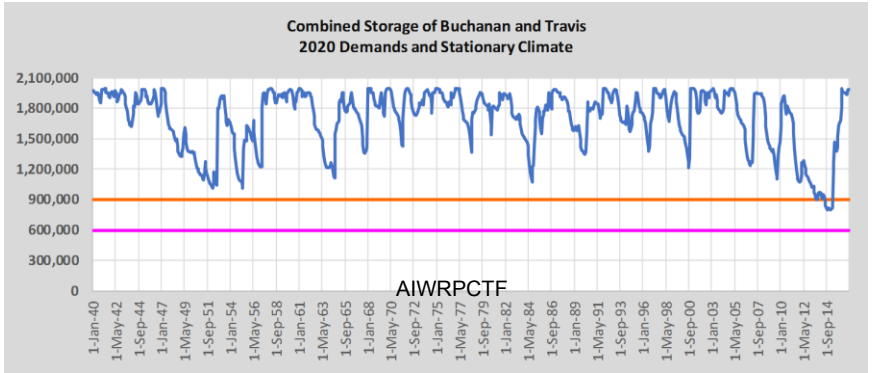
	Annual Need, ac-ft
A	-

	Annual Need, ac-ft
B	-

(A)

Period of Record (77 years)



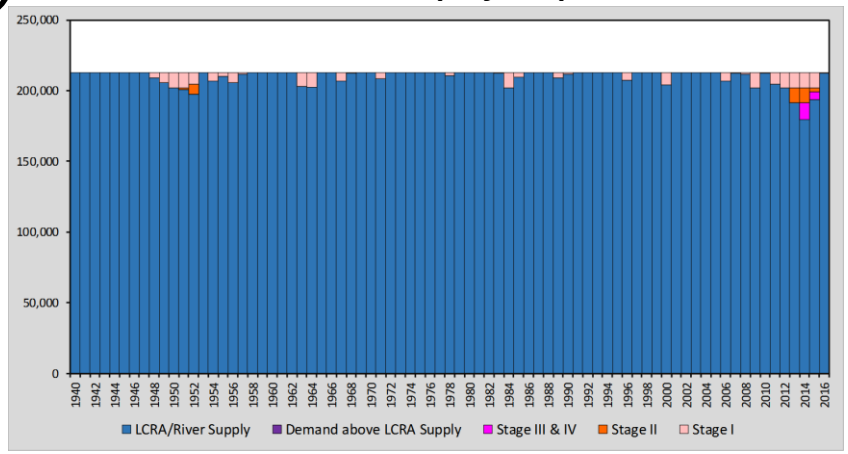


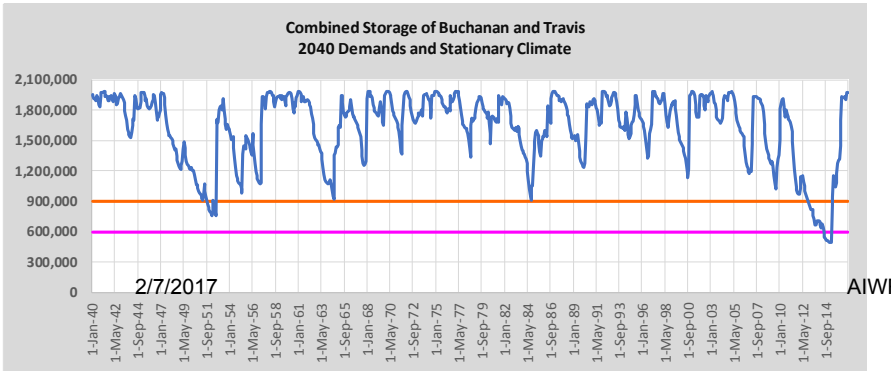
2040 City of Austin Needs Summary

	Needs During Prolonged Drought					Needs During Prolonged Drought				Needs above Current Contract		Needs above Current Contract
	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft	Annual Need, ac-ft		Annual Need, ac-ft
A	17,802	0.9	17,802	17,802	B	78,851	2.8	28,673	32,545	-	B	-

A

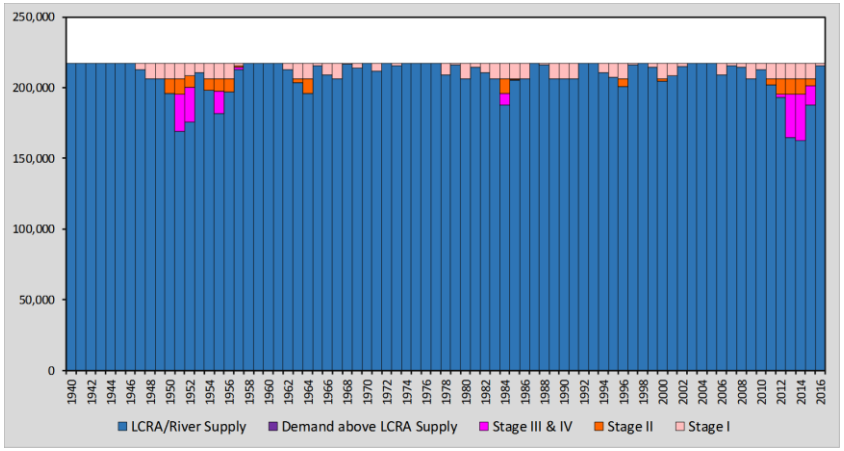
Period of Record (77 years)

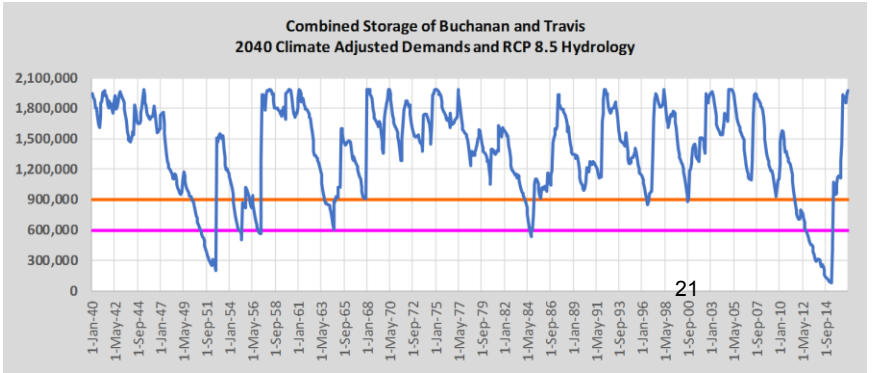




B

Period of Record (77 years) Climate-Adjusted



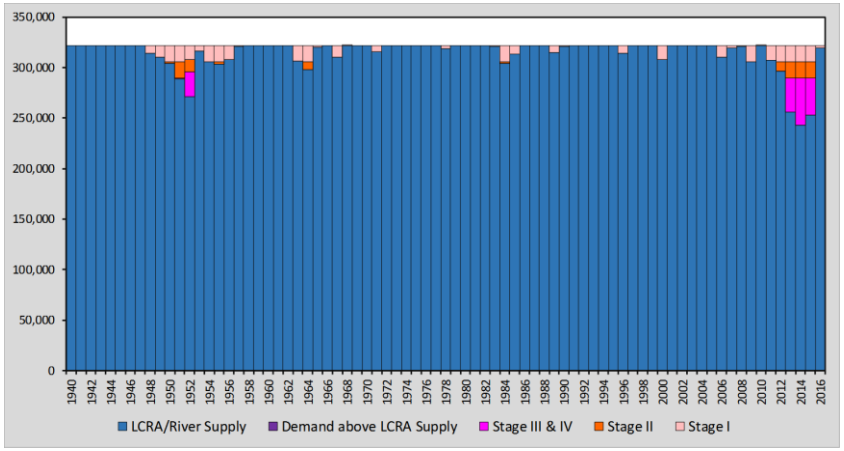


2070 City of Austin Needs Summary

	Needs During Prolonged Drought					Needs above Current Contract				
	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft	
A	117,563	2.8	42,750	48,304	B	240,100	5.2	46,471	50,236	
	Annual Need, ac-ft					Annual Need, ac-ft				
A	-				B	7,562				

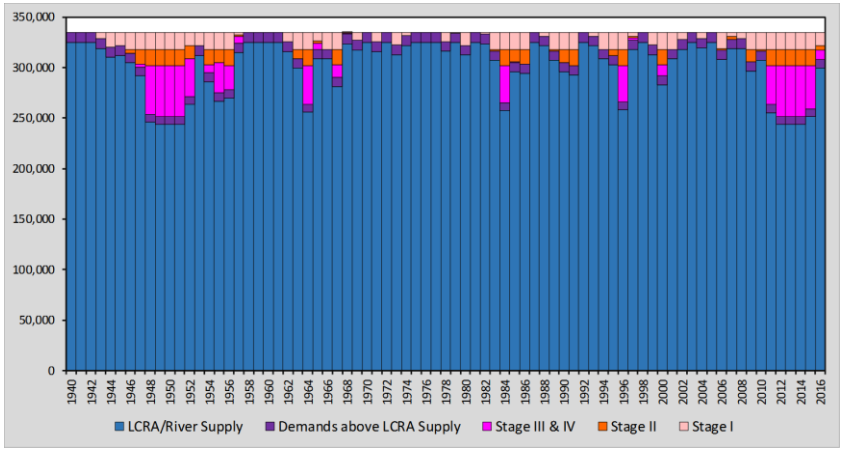
A

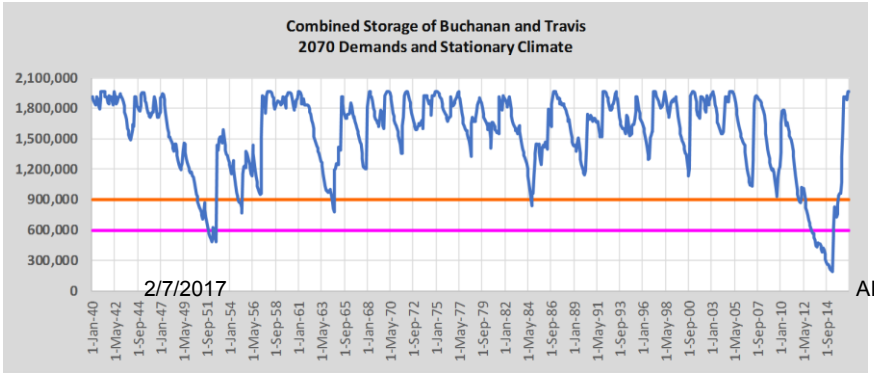
Period of Record (77 years)

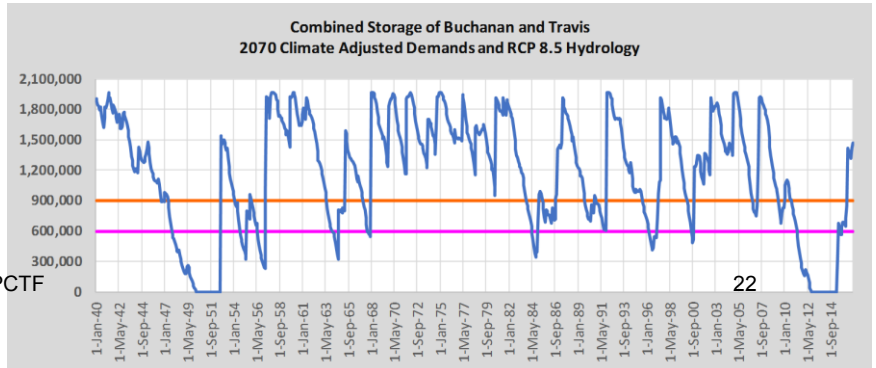


B

Period of Record (77 years) Climate-Adjusted





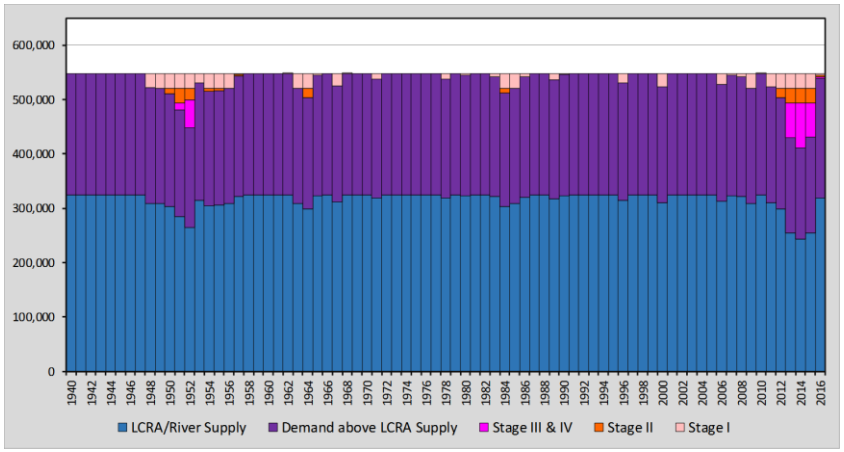


2115 City of Austin Needs Summary

	Needs During Prolonged Drought					Needs above Current Contract	
	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft	Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft	Annual Need, ac-ft	Annual Need, ac-ft
A	212,395	3.1	68,885	82,234					220,823	
B					503,241	6.7	75,486	87,168		253,801

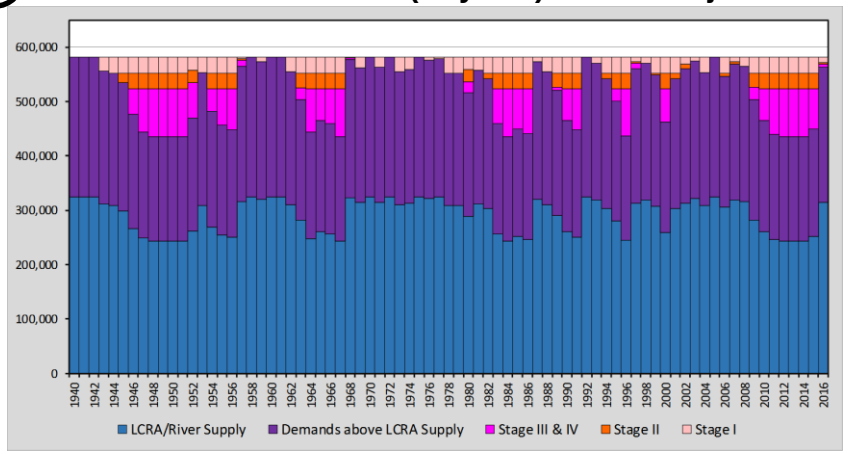
A

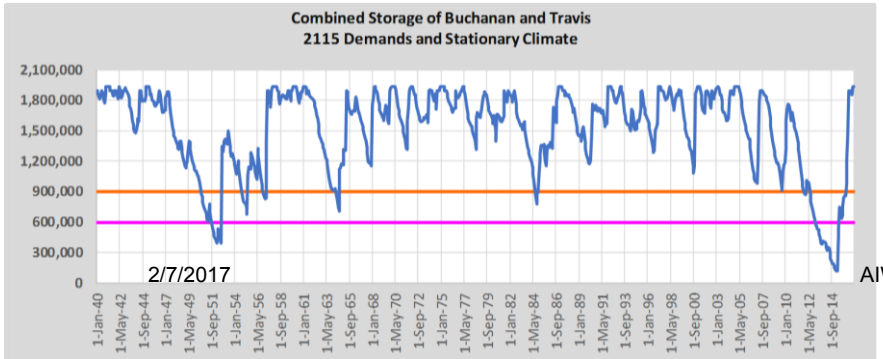
Period of Record (77 years)

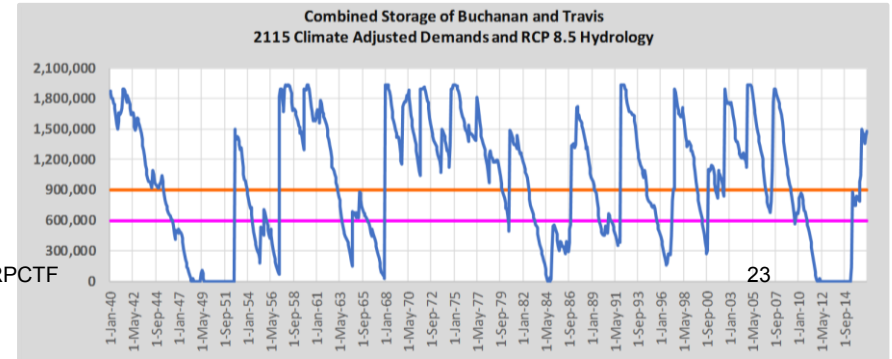


B

Period of Record (77 years) Climate-Adjusted







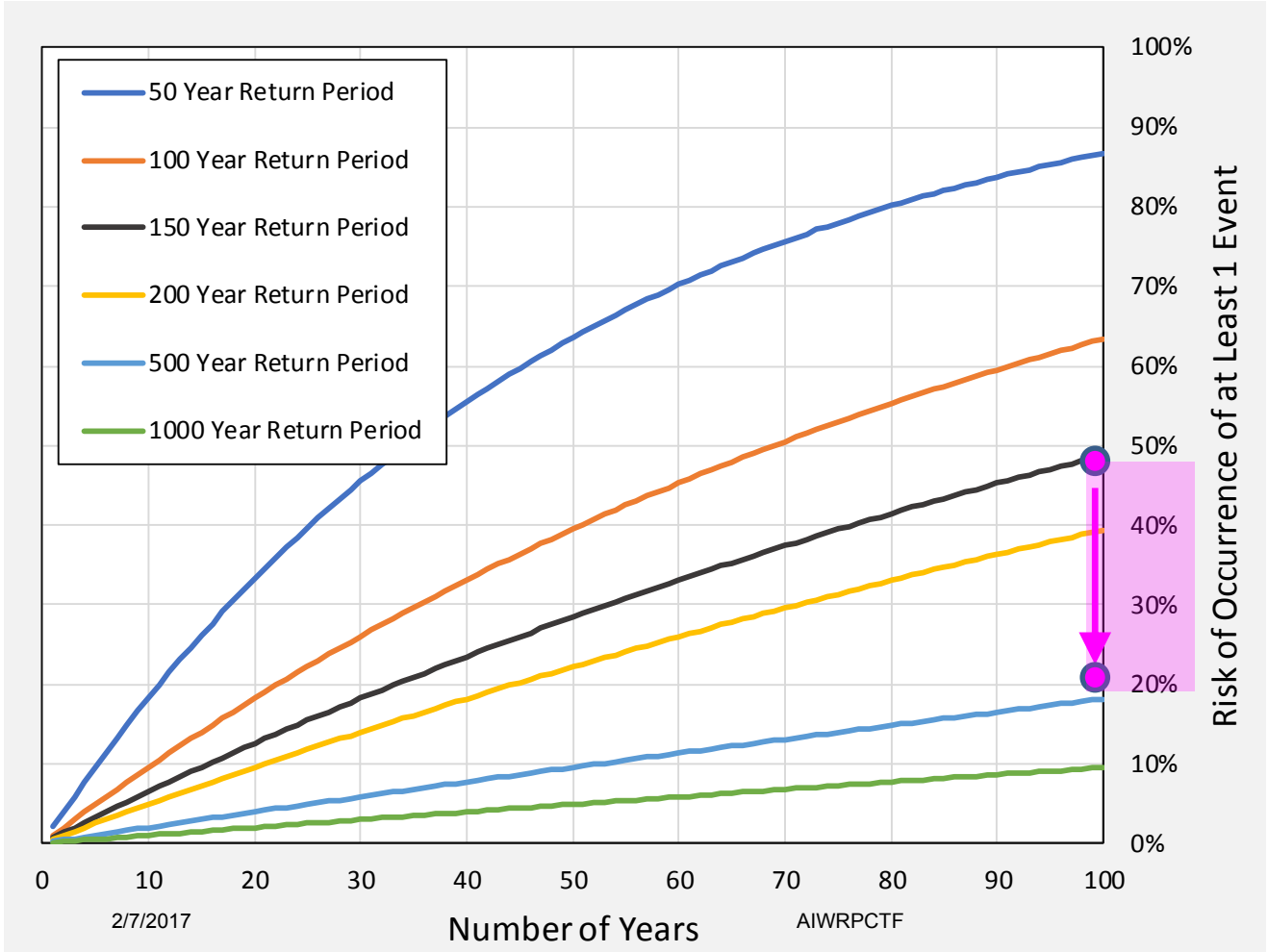
Monte Carlo Markov Chain – 10,000 year Simulations

Droughts Worse than the Drought of 2007-2016

- Evaluating portfolios for conditions worse than the recent drought is a key piece of the Water Forward analyses.
- The extended 10,000 year simulation is a tool for developing a range of conditions worse than the drought of 2007-2016
- 1,365 drought events identified between 12 and 224 months in the 10k year simulation.
- 74 of those droughts are worse than the 2007-2016 drought according to a calculation of drought return period based on inflow severity and duration.

Return Period and Risk of Occurrence

$$Risk\ of\ at\ Least\ 1\ Occurrence\ = 1 - \left(1 - \frac{1}{Return\ Period}\right)^{Number\ \ of\ Years}$$



Drought of 2010's has a return period of 156 years relative to the other droughts in the 10,000 year simulation.

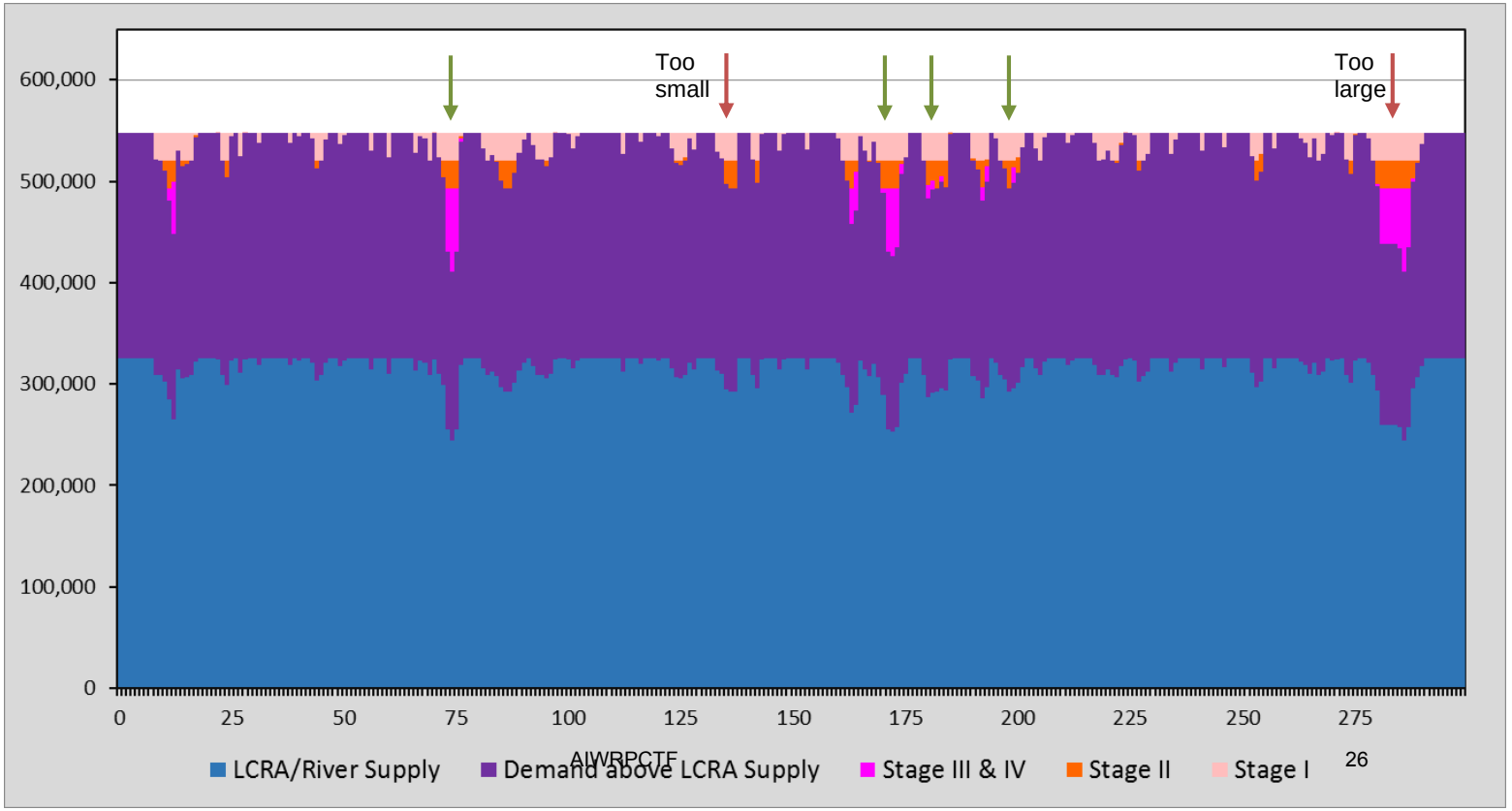
This equates to **47.3%** risk of at least 1 occurrence in 100 years.

Drought events with a lower risk of occurrence, down to 20%, were selected for analysis.

City of Austin Needs Summary

Planning Horizon Year		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft
	C	-	-	-	-
	D	-	-	-	-

2115 Demands, Stationary Climate



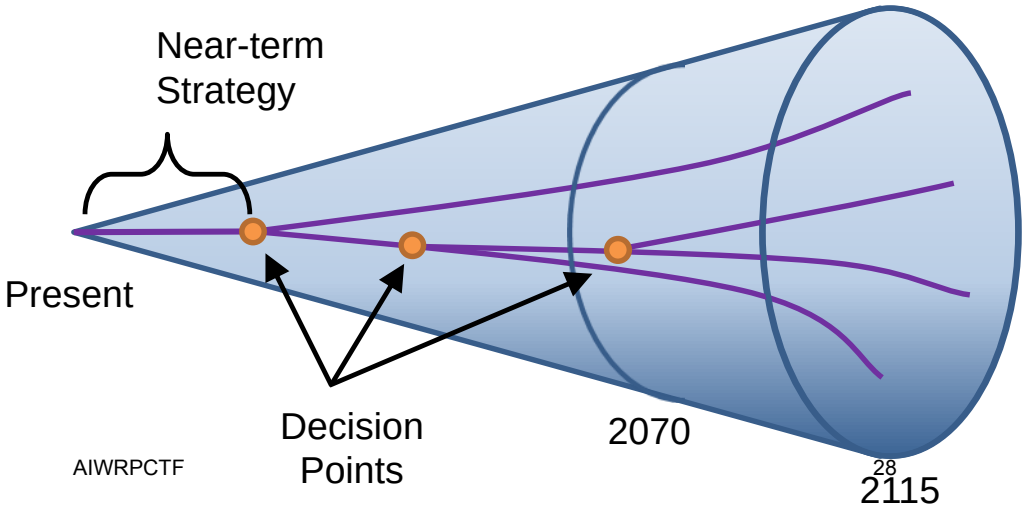
City of Austin Needs Summary
Droughts Worse than the Drought of 2007-2016

		Needs During Prolonged Drought								Needs above Current Contract			
		MCMC (10,000 years)					MCMC (10,000 years) Climate Change-Adjusted					MCMC (10,000 years)	
		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Annual Need, ac-ft	Annual Need, ac-ft
2020	C	18,997	1.2	16,283	18,997	D	No Significant Change from Period of Record				C	-	-
2040	C	40,543	1.8	22,326	31,907	D	139,046	5.0	27,838	32,545	C	-	-
2070	C	159,230	4.0	39,563	48,304	D	442,702	9.4	47,270	50,236	C	-	7,562
2115	C	312,638	4.5	69,609	82,234	D	967,538	11.5	83,882	87,168	C	220,823	253,801

Recap/Summary

- **City of Austin Needs**
  - **Needs During Prolonged Drought** = Demand reductions from implementation of Stages 3&4
  - **Needs Above Current Contract** = Baseline demands above current 325,000 AF contract with LCRA

- **Regional Needs** = include periods when combined storage levels dip below emergency levels

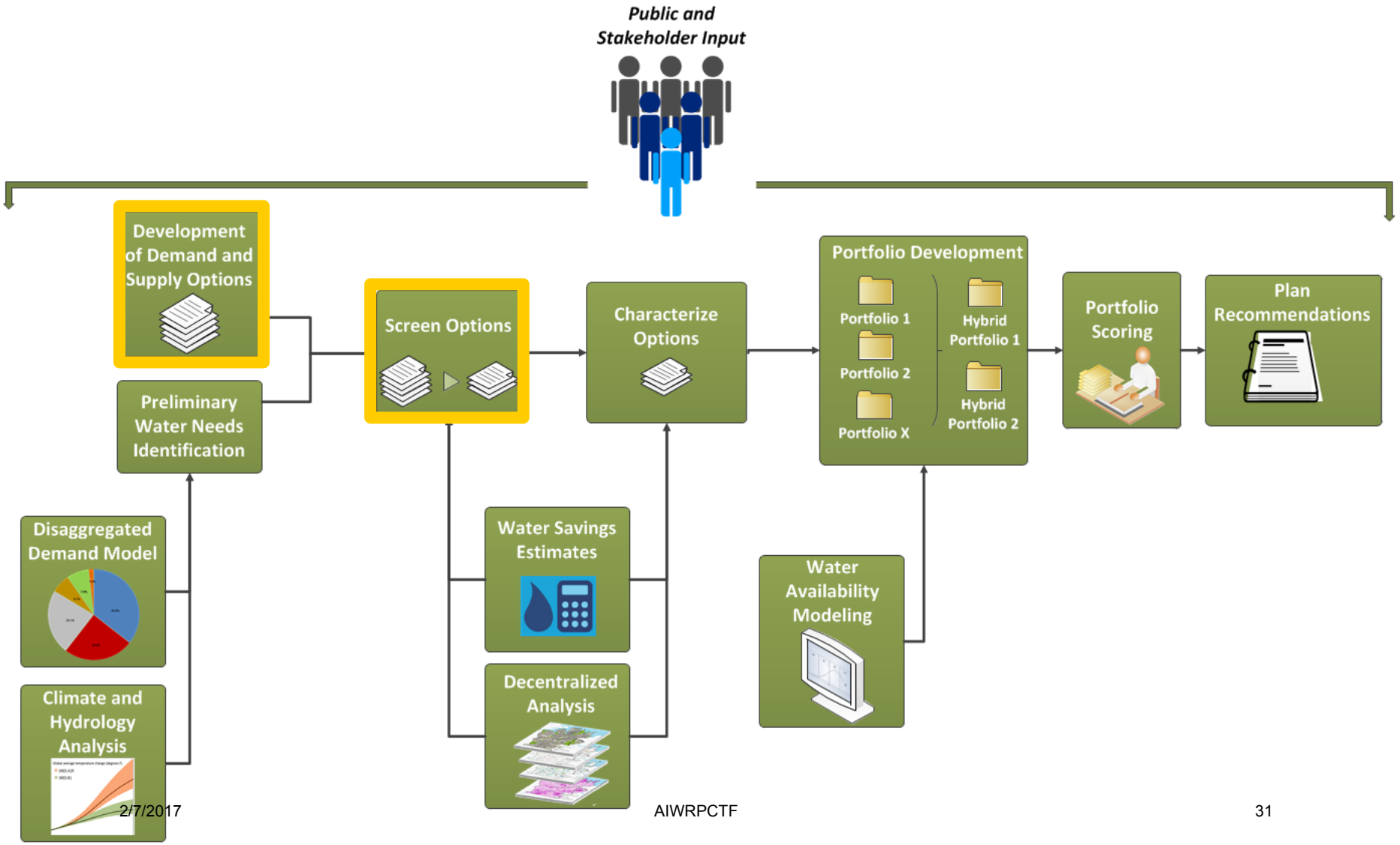


City of Austin and Regional Needs Summary

		Needs During Prolonged Drought								Needs above Current Contract			
		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft		Cumulative Need, ac-ft	Consecutive Number of years in Stage III or IV	Average Need per year, ac-ft	Max Need per year, ac-ft	Annual Need, ac-ft		Annual Need, ac-ft	
2020	A	0	0	na	na	B	No Significant Change from Period of Record				A	-	B	-
	C	18,997	1.2	16,283	18,997	D	No Significant Change from Period of Record				C	-	D	-
2040	A	17,802	0.9	17,802	17,802	B	78,851	2.8	28,673	32,545	A	-	B	-
	C	40,543	1.8	22,326	31,907	D	139,046	5.0	27,838	32,545	C	-	D	-
2070	A	117,563	2.8	42,750	48,304	B	240,100	5.2	46,471	50,236	A	-	B	7,562
	C	159,230	4.0	39,563	48,304	D	442,702	9.4	47,270	50,236	C	-	D	7,562
2115	A	212,395	3.1	68,885	82,234	B	503,241	6.7	75,486	87,168	A	220,823	B	253,801
	C	312,638	4.5	69,609	82,234	D	967,538	11.5	83,882	87,168	C	220,823	D	253,801

Demand management and supply side options presentation

Preliminary Water Needs Identification
informs the development and screening of options



Preliminary Water Needs Identification informs the development and screening of options

Preliminary Water Needs Identification

Water Needs Identification

- Cumulative drought magnitude and duration
- Drought return period

Disaggregated Demand Model

Disaggregated Demand Model

- Sector and end use breakdowns to identify potential areas for additional conservation savings

Options Development and Screening

Informs Magnitude of Options

- Scale of savings or yield

Informs Types of Options

- Flexible, constant, etc.

Helps Prioritize Options for Screening

Development of Demand and Supply Options

Screen Options

Demand Management Options

	Measure	Sector	End Use
a	Enhance current water loss control programs	Systemwide	Non Revenue Water
b	Automatic metering infrastructure	All	All
c	Turf grass area, irrigated area, and/or irrigation system limitations	SF & MF RES, & COM	Irrigation
d	Increase WaterWise landscape rebates	SF & MF RES	Irrigation
e	New WaterWise landscape rebate	COM	Irrigation
f	Incentivize and/or require on-site alternative water use for new developments	All (new development)	Non-potable indoor, irrigation
g	Modify current rainwater harvesting rebate to encourage larger scale commercial systems	COM	Non-potable indoor, irrigation
h	Graywater system incentives	All	Non-potable indoor, irrigation
i	Explore innovative building and plumbing requirements to expand non-potable use of alterative water sources including reclaimed (ex., dual plumbing)	SF & MF RES, COM, others	Non-potable indoor, irrigation
j	Expanded smart controller rebate with sensors	SF & MF RES, COM, others	Irrigation

Demand Management Options

No.	Measure	Sector	End Use
k	Retrofit old inefficient irrigation systems	SF & MF RES, COM, others	Irrigation
l	Eliminate irrigation system requirement	MF RES & COM, potentially others	Irrigation
m	Explore water fee and rate structure changes	All	All
n	Large property benchmarking ordinance	MF RES, COM, potentially others	All
o	Require water use estimate submittal for new development benchmark review	SF & MF RES, COM, others	All
p	AC condensate recovery	MF RES, COM, potentially others	Non-potable indoor, irrigation
q	Require cooling towers to meet water efficiency standards	COM, potentially others	HVAC (cooling)
r	Require steam boiler and other efficiency standards	COM, potentially others	HVAC, Boilers, and other large equipment
s	Disclosure at point of sale of non-compliant water using equipment or fixtures	MF RES, COM, potentially others	All
t	Swimming pool water use efficiency	MF RES & COM, potentially others	Pools

Demand Management Options

No.	Measure	Sector	End Use
u	Require WaterSense/Energy STAR	All	All
v	Indoor fixture upgrades	All	All
w	Expand reclaimed system connection requirements or incentives to existing	MF RES, COM, potentially others	Non-potable indoor, irrigation
x	Enhance education and outreach	All	All
y	Enhance web site and social media	All	All

Water Supply Options

Water Reuse and Rainwater/Stormwater Capture Options

1. Direct non-potable reuse (centralized reclaimed purple-pipe system)
2. Indirect potable reuse through Lady Bird Lake (FEA 2)
3. Indirect potable reuse through alluvial aquifer (FEA 3)
4. Indirect reuse – bed and banks (City of Austin and LCRA joint TCEQ application for bed and banks transport of COA treated effluent)
5. Direct potable reuse
6. Sewer mining (wastewater skimming) – utility-scale decentralized option
7. Distributed wastewater systems – utility-scale decentralized option
8. Stormwater and/or Rainwater Harvesting – utility-scale decentralized option

Water Supply Options

Enhanced Storage Options

9. Aquifer storage and recovery (Northern Edwards and Trinity Aquifers) (FEA 5)
10. Lake Austin operations (drought strategy – lake level variation)
11. Capture Lady Bird Lake inflows (FEA 4)
12. Enhanced off-channel storage at Walter E. Long Lake (Decker Lake) (FEA 1)

New Supply Options

13. Brackish groundwater desalination
14. Seawater desalination
15. Conventional groundwater (from Task Force)
16. Additional LCRA supply (from Task Force)
17. Lake evaporation suppression(from consultant team)

Next Steps

- February 13th Deadline
  - Task Force feedback on blue sky list of supply options and list of 25 demand management options due
- March 7th Task Force Meeting
  - Presentation on screening from 25 to 10 demand management options
  - Presentation on 22 supply options to be screened

BACKUP MATERIALS

Blue Sky List of Water Supply Options with Descriptions

Relative magnitudes indicated for each option are planning level estimates and may be refined through the IWRP process.

Relative Magnitude of Annual Supply (Acre-Feet)	Resiliency	Supply Types
< 10,000 AF	Low	Drought
10-20,000 AF	Medium	Constant
>20,000 AF	High	Variable

	Option	Brief Description	Est. Annual Supply	Resiliency	Supply Type
1	Aquifer storage and recovery (FEA 5)	Aquifer storage and recovery is a strategy in which water (ex: potable drinking water) can be stored in an aquifer during wetter periods and recovered for use during drier periods. Storing water underground can improve drought preparedness and reduces the amount of water that evaporates compared to water storage in open above-ground reservoirs. This type of strategy is currently being used by cities in Texas including San Antonio, Kerrville and El Paso. Exploring aquifer storage and recovery as a potential option was a recommendation of the 2014 Task Force and has been analyzed by Austin Water as part of Feasibility and Engineering Analysis #5 (Northern Edwards and Trinity Aquifers).		Medium	Drought
2	Direct non-potable reuse (centralized reclaimed purple-pipe system)	Through its Water Reclamation Initiative (WRI) program, Austin Water provides highly treated wastewater effluent for non-potable uses such as irrigation, cooling, manufacturing, and toilet flushing. Austin's direct reuse (purple pipe) system currently supplies approximately 4,600 AF per year. The 25-year direct reuse system master plan includes a total of 130 miles of transmission mains to be constructed and an estimated annual use volume of 25,600 AF. Potential expansion beyond this amount may be explored as part of the IWRP process.		High	Constant
3	Lake Austin operations (lake level variation)	This option is an operational drought strategy to vary the Lake Austin operating level during non-peak months (October-May) and after combined storage in the Highland Lakes falls below 600,000 acre-feet. This strategy would allow local usage to draw the lake down a maximum of three feet to be able to catch runoff from local storm events should they occur. This approach would allow for use of this runoff as opposed to excess runoff spilling over Tom Miller Dam to flow downstream. This measure was included as a recommendation of the 2014 Task Force.		Low	Drought
4	Stormwater and Rainwater Harvesting	This option involves the collection and reuse of rainwater or stormwater to meet appropriate end use demands. The implementation of this strategy is dependent on a number of factors including the catchment area, storage capacity, rainfall frequency, and water demand of the end user. On average, the Austin area generally receives about 32 inches of rainfall per year. This rainfall is not distributed uniformly during the year and, as a result, implementation of this strategy should consider water demands and supplies over a multi-month period. This option is being analyzed as part of Task 6.3.		Low	Constant, subject to availability
5	Sewer mining (wastewater skimming)	This option involves the extraction (mining or scalping) of wastewater from the centralized sewer system, treatment at a small local facility, and reuse to meet non-potable demands. Implementation of this strategy is highly site-specific, dependent on factors including accessibility of wastewater flows and proximity to suitable non-potable demands, with drivers being to minimize potable water consumption and infrastructure upsizing. Wastes from the treatment process are typically discharged to the centralized sewer system for subsequent treatment at the downstream Wastewater Treatment Plants (WWTPs). This option is being analyzed as part of Task 6.3.		High	Constant
6	Distributed wastewater systems	This option involves the onsite capture and treatment of the wastewater stream generated in a building or development for reuse to meet non-potable demands onsite. To be feasible, this option requires that a building or development have sufficient non-potable demand to beneficially use all of the reuse water that is produced and that the building have enough wastewater available to reuse and meet non-potable demands. Types of treatment systems may include constructed wetlands (for example the "Living Machine" at SFPUC), membrane bioreactors, etc. This option is being analyzed as part of Task 6.3.		High	Constant
7	Capture Lady Bird Lake Inflows (FEA 4)	This option would Capture available spring and stormwater flow into Lady Bird Lake and convey the water to the Ullrich WTP through a potential new intake pump and piping system. Exploring capturing Lady Bird Lake inflows as a potential option was a recommendation of the 2014 Task Force and has been analyzed by Austin Water as part of Feasibility and Engineering Analysis #4.		Low	Variable

	Option	Brief Description	Est. Annual Supply	Resiliency	Supply Type
8	Indirect reuse – bed and banks	Recapture discharged treated effluent from Austin's Wastewater Treatment Plants downstream to be pumped back upstream for treatment. City of Austin and LCRA have applied jointly for the water right permit for indirect reuse in accordance with the terms of the 2007 settlement agreement between Austin and LCRA.	Variable, subject to permitting, availability, and terms of the 2007 agreement		
9	Indirect Potable Reuse through Lady Bird Lake (FEA 2)	This option would convey highly treated reclaimed water from one treatment train at South Austin Regional Wastewater Treatment Plant to Lady Bird Lake and subsequently divert water by a potential new intake pump and piping system downstream of Tom Miller Dam to the Ullrich Water Treatment Plant to help meet City demands. This approach could supplement water releases from lakes Buchanan and Travis to extend water supplies during severe drought. This option was a recommendation of the 2014 Task Force and has been analyzed by Austin Water as part of Feasibility and Engineering Analysis #2		High	Drought
10	Indirect Potable Reuse through Alluvial Aquifer (FEA 3)	This option would convey highly treated reclaimed water from one treatment train at South Austin Regional Wastewater Treatment Plant to an infiltration basin within the Colorado River alluvium. After a minimum six month retention time, recovery wells and pump station would capture and transport the water to Lady Bird Lake. A potential new intake pipe and pump station downstream of Tom Miller Dam would convey the water to the Ullrich Water Treatment Plant to help meet City demands. This approach could supplement water releases from lakes Buchanan and Travis to extend water supplies during severe drought. Exploring reclaimed water infiltration as a potential option was a recommendation of the 2014 Task Force and has been analyzed by Austin Water as part of Feasibility and Engineering Analysis #3.		High	Variable
11	Direct potable reuse	This option is relatively new to Texas and involves taking treated wastewater effluent, further treating it at an advanced water treatment plant, and then either introducing it upfront of the water treatment plant or directly into the potable water distribution system.		High	Constant
12	Desalination – brackish groundwater	Desalination is the process of removing dissolved solids from seawater or brackish groundwater, often by forcing the source water through membranes under high pressure. The specific process used to desalinate water varies depending upon the total dissolved solids, the temperature, and other physical characteristics of the source water but always requires disposal of concentrate that has a higher total dissolved content than the source water. Disposal may take the form of an injection well, evaporation beds, or an ocean outfall diffuser. Exploring desalination of brackish groundwater as a potential option was a recommendation of the 2014 Task Force		High	Constant
13	Desalination – seawater	Desalination is the process of removing dissolved solids from seawater or brackish groundwater, often by forcing the source water through membranes under high pressure. The specific process used to desalinate water varies depending upon the total dissolved solids, the temperature, and other physical characteristics of the source water but always requires disposal of concentrate that has a higher total dissolved content than the source water. Disposal may take the form of an injection well, evaporation beds, or an ocean outfall diffuser.		High	Constant
14	Enhanced Off-Channel Storage at Walter E. Long Lake (Decker Lake) (FEA 1)	If Decker Power Station were taken offline and Walter E. Long (Decker) Lake was no longer needed for electric generation purposes, this strategy would involve use of the lake as enhanced off-channel storage for water supply augmentation. Enhanced operations of Lake Long would allow more fluctuation in the lake level than current operations, up to approximately 25 feet. In concept, the strategy would allow water from Lake Long to be released to meet downstream needs, including environmental flows and other uses, which would otherwise need to be released from Lakes Travis and Buchanan. This strategy would require making improvements to increase the capacity to refill Lake Long through a combination of Colorado River water and reclaimed water. This option was a recommendation of the 2014 Task Force and has been analyzed by Austin Water as part of Feasibility and Engineering Analysis #1. Based on preliminary results from this analysis, potential for water quality issues and lower than expected yields have been indicated.		Low	Drought
15	Lake Evaporation Suppression	Under development		High	Variable
16	Conventional Groundwater	Under development	TBD	Medium	Variable
17	Additional supply from LCRA	Under development	TBD	Medium	Constant

Option	Brief Description	Est. Annual Supply	Resiliency	Supply Type
	Not included on original draft COA list based on previous processes and input: Imported Groundwater			

Austin Water - Demand Assumptions for Water Forward Modeling
DRAFT - SUBJECT TO CHANGE, 2/7/2017

	DEMAND CATEGORY / PARAMETER All Demands in units of acre-feet per year.	Year 2020	Year 2040	Year 2070	Year 2115	Climate Adjusted Demands Year 2040	Year 2070	Year 2115
[1]	**Firm Demands**					**2.0%**	**4.0%**	**6.0%**
[2]	City of Austin Municipal Baseline Demand (Avg Year)	153,649	212,712	322,025	548,224	216,966	334,906	581,117
[3]	City of Austin Municipal Direct Reuse (Avg Year)	3,816	3,816	3,816	3,816	3,816	3,816	3,816
[3a]	City of Austin Parks and LBL Evap	1,415	1,415	1,415	1,415	1,443	1,472	1,500
[4]	**City of Austin Baseline + Reclaimed + Parks + LBL Evap Demand Total**	**158,880**	**217,943**	**327,256**	**553,455**	**222,226**	**340,194**	**586,433**
[5]	Fayette County (Power generation downstream of lakes)	20,000	20,000	20,000	20,000	20,000	20,000	20,000
[6]	Sim Gideon / Lost Pines Demand	0	0	0	0	0	0	0
[7]	Llano County (Power generation near/upstream of lakes)	5,500	11,300	20,000	20,000	11,300	20,000	20,000
[8]	**LCRA - Power Plant Demand**	**25,500**	**31,300**	**40,000**	**40,000**	**31,300**	**40,000**	**40,000**
[9]	Fayette County	9,000	9,000	9,000	9,000	9,000	9,000	9,000
[10]	Travis County	0	500	500	500	500	500	500
[11]	**City of Austin - Power Plant Demand**	18,000	18,500	18,500	18,500	18,500	18,500	18,500
[12]	Municipal Firm Contract Demand	54,022	53,839	68,046	72,000	54,915	70,768	76,320
[13]	LCRA New Contracts (Region K Table 5-19)	2,877	19,154	33,654	45,000	19,537	35,000	47,700
[14]	Domestic lakeside use	5,000	5,000	5,000	5,000	5,000	5,000	5,000
[15]	LCRA Firm Irrigation	4,800	7,400	10,000	10,000	7,548	10,000	10,000
[16]	BRA - HB 1437 Demand	6,386	25,000	25,000	25,000	25,000	25,000	25,000
[17]	Manufacturing and Mining Demand	16,253	18,277	20,300	24,000	18,642	21,112	25,440
[18]	Other (Conveyance and Emergency Release)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
[19]	**Other Municipal, Industrial, Misc Firm Demands**	**106,000**	**177,000**	**242,000**	**283,000**	**179,840**	**249,880**	**297,280**
[20]	**Total Firm Demand, Rows 4+8+11+19:**	**308,380**	**444,743**	**627,756**	**894,955**	**451,866**	**648,574**	**942,213**
[21]	STPNOC ROR + LCRA Backup	102,000	102,000	102,000	102,000	102,000	102,000	102,000
[22]	Corpus Christi Garwood Water Rights	35,000	35,000	35,000	35,000	35,000	35,000	35,000
	Interruptible Agricultural Demand							
[23]	Garwood Irrigation Demand (Dry - 90th Percentile)	89,700	85,300	79,200	69,300	90,369	86,546	77,258
[24]	Gulf Coast Irrigation Demand (Dry - 90th Percentile)	147,400	113,400	103,900	88,600	136,928	127,371	111,875
[25]	Lakeside Irrigation Demand (Dry - 90th Percentile)	135,500	128,100	119,300	106,700	137,464	131,580	121,074
[26]	Pierce Ranch Irrigation Demand (Dry - 90th Percentile)	27,000	25,600	24,100	22,300	26,091	25,608	24,390
[27]	**Total Interruptible Agricultural Demand, Rows 23+24+25+26:**	**399,600**	**352,400**	**326,500**	**286,900**	**390,852**	**371,106**	**334,597**

Note: All other surface water demands in the water availability model are represented at full water right authorization levels.