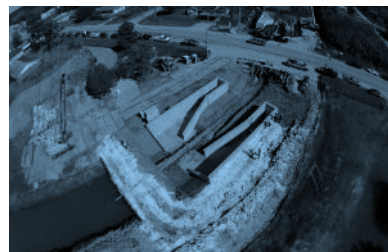




# Raw Water Supply Master Plan Development

## Stakeholder Outreach Meeting - II

31 August 2016



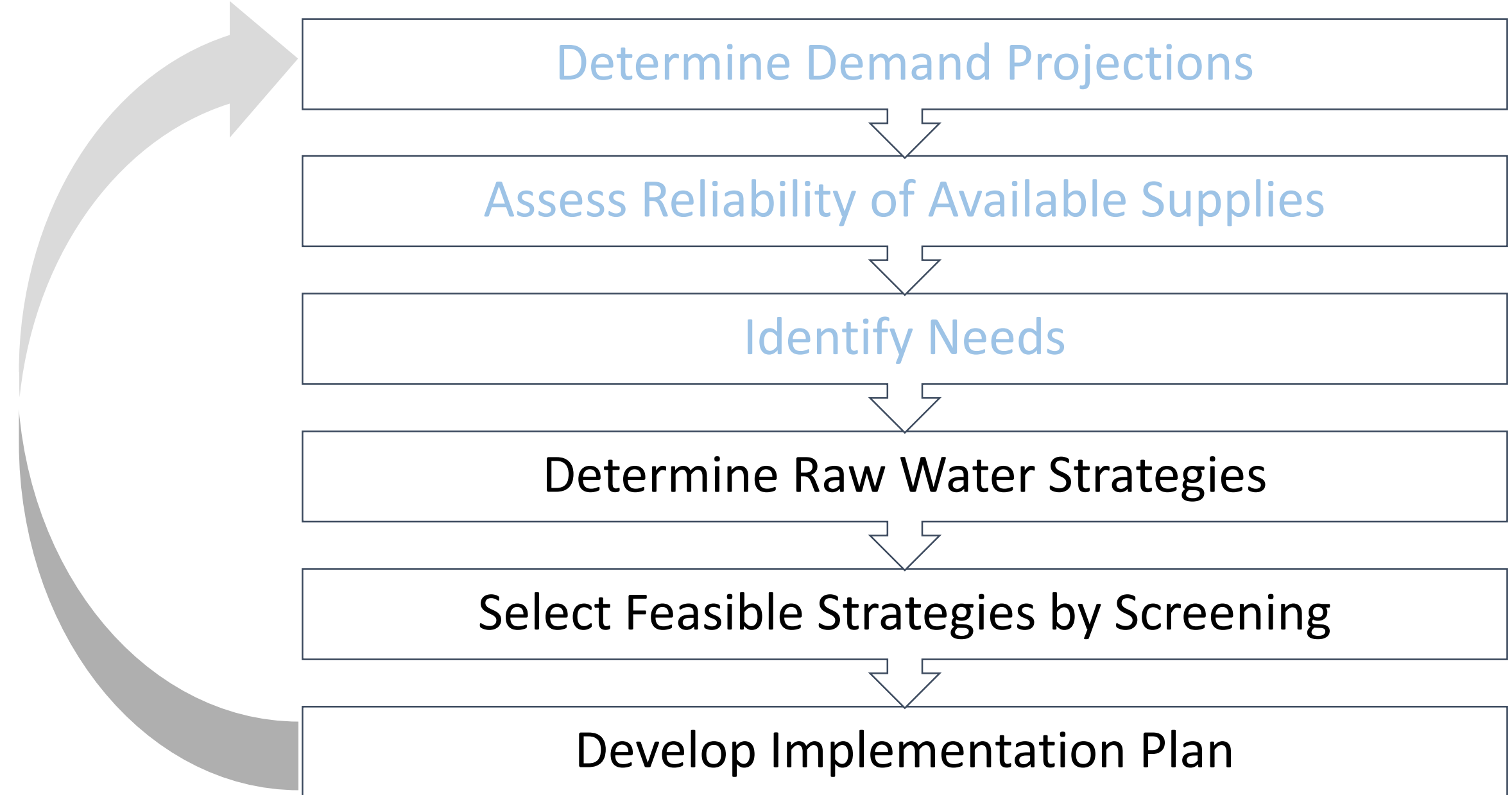
Welcome

# Introductions

# Master Plan Goals and Objectives

- Refine our standard approach to long-term plan for securing raw water supplies
- Review needs and develop raw water supplies for *Montgomery County* and *Highlands* systems
- Develop an implementation plan for adding raw water supplies to SJRA portfolio

# Approach



Demand Scenario Evaluation											
Supply Scenario Evaluation											
Preliminary Strategy Identification and Evaluation											
Strategy Evaluation and Selection											

# Focus for this Meeting

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Review demands, supplies, and needs

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Discuss approach for water supply strategy selection

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Review water supply strategies

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Next steps

# Review of Outreach Meeting - 1

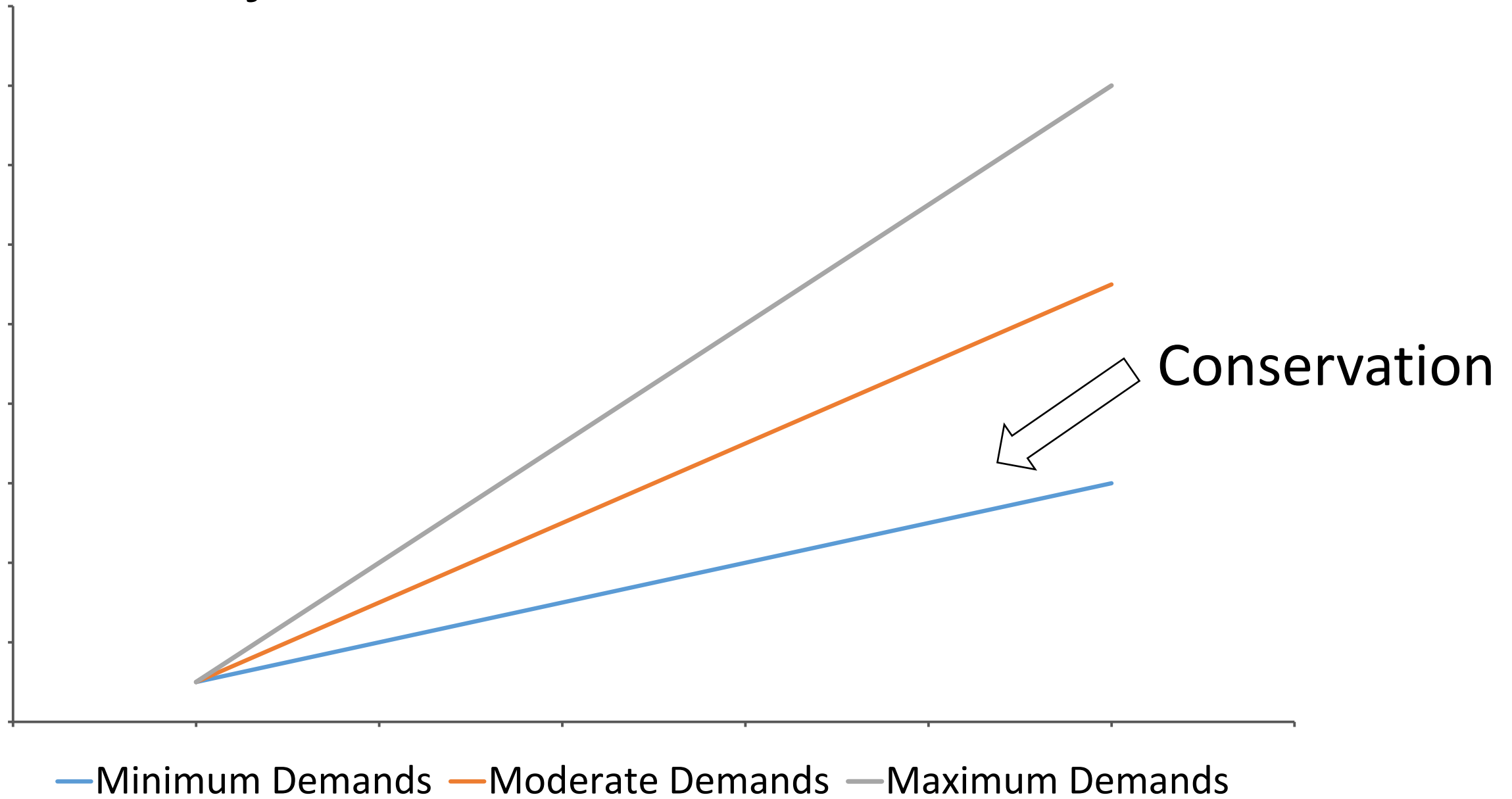
Demands, supplies, and needs



# Demands

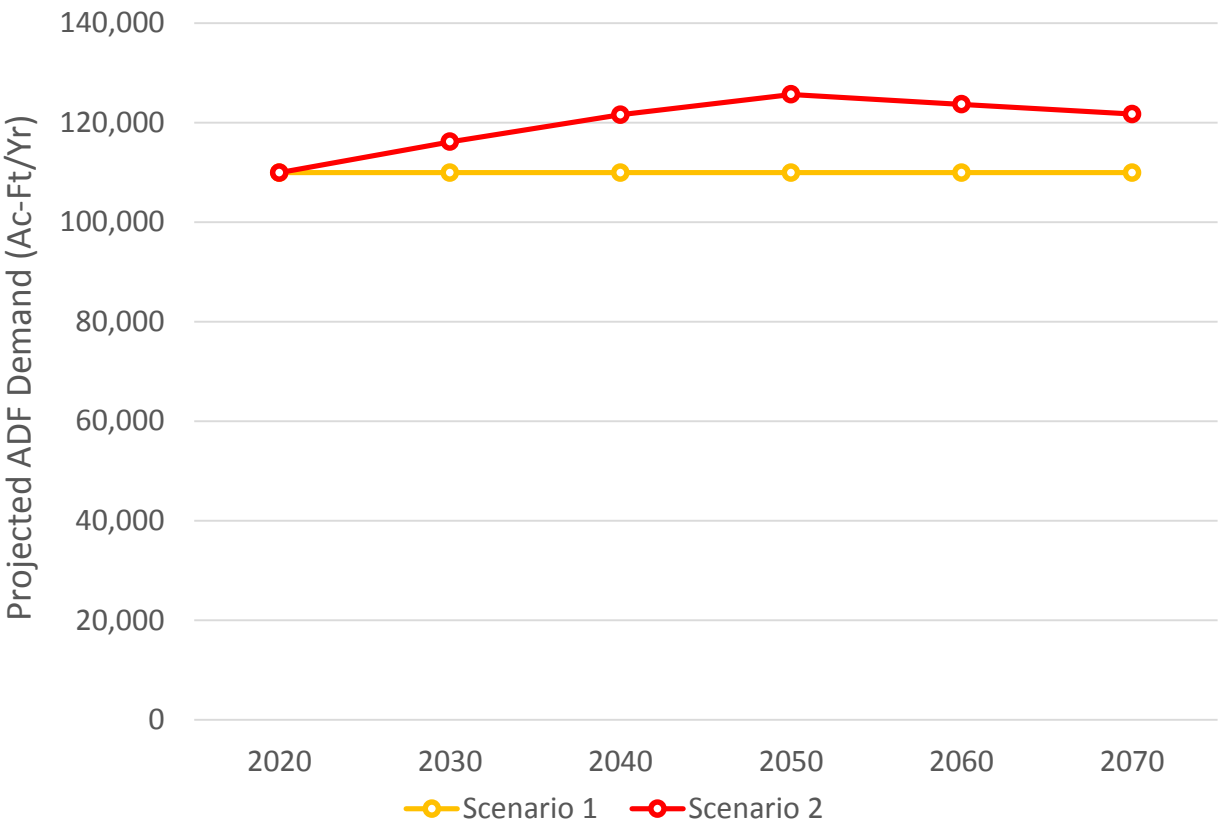
Demand scenario evaluation

# Demand Projections Alternatives



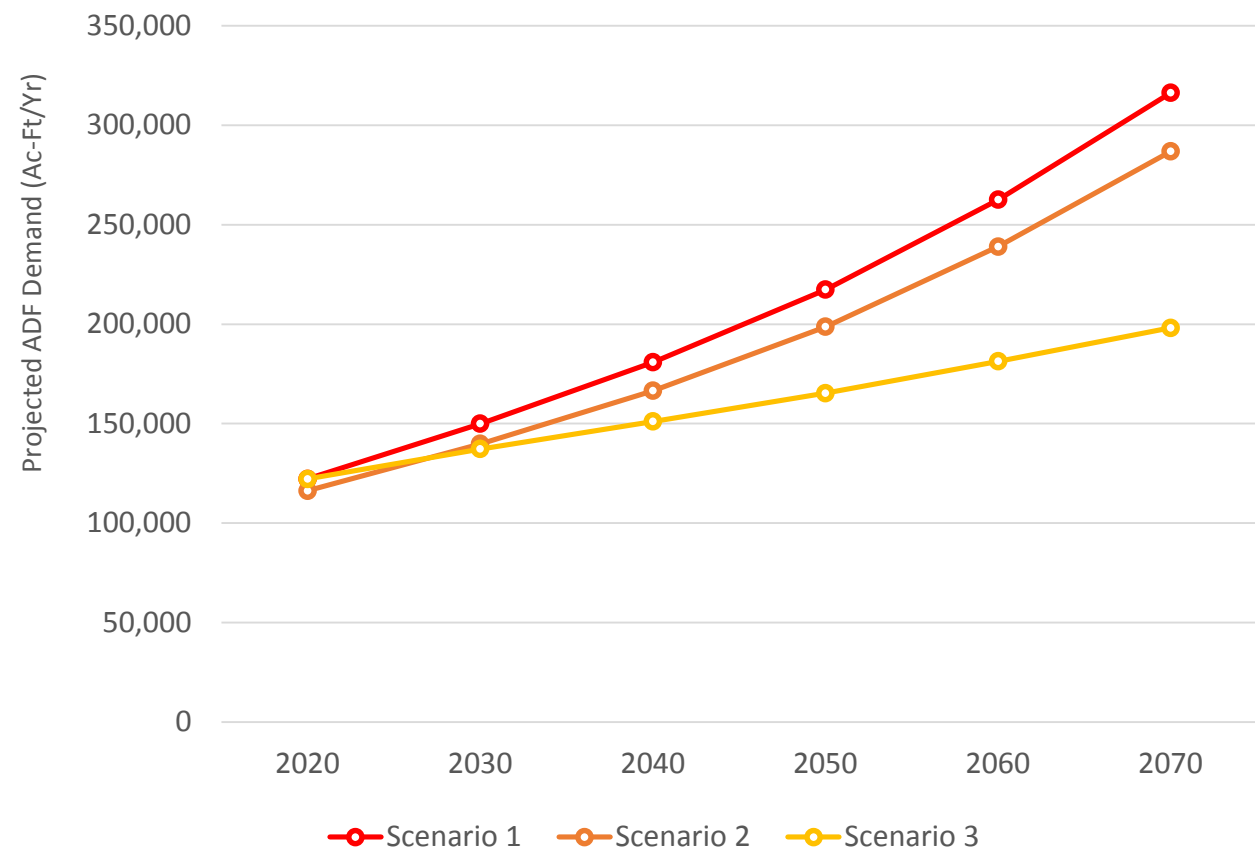
# Results - Highlands Selected Demand Scenarios

Scenario	Industrial Projection	Irrigation Projection	Municipal Projection
1	Expanded Contracts	Current Contracts	Current Contracts
2	Expanded Contracts + Region H Growth	Current Contracts	Current Contracts + Region H Growth



# Results - Montgomery County Selected Demand Scenarios

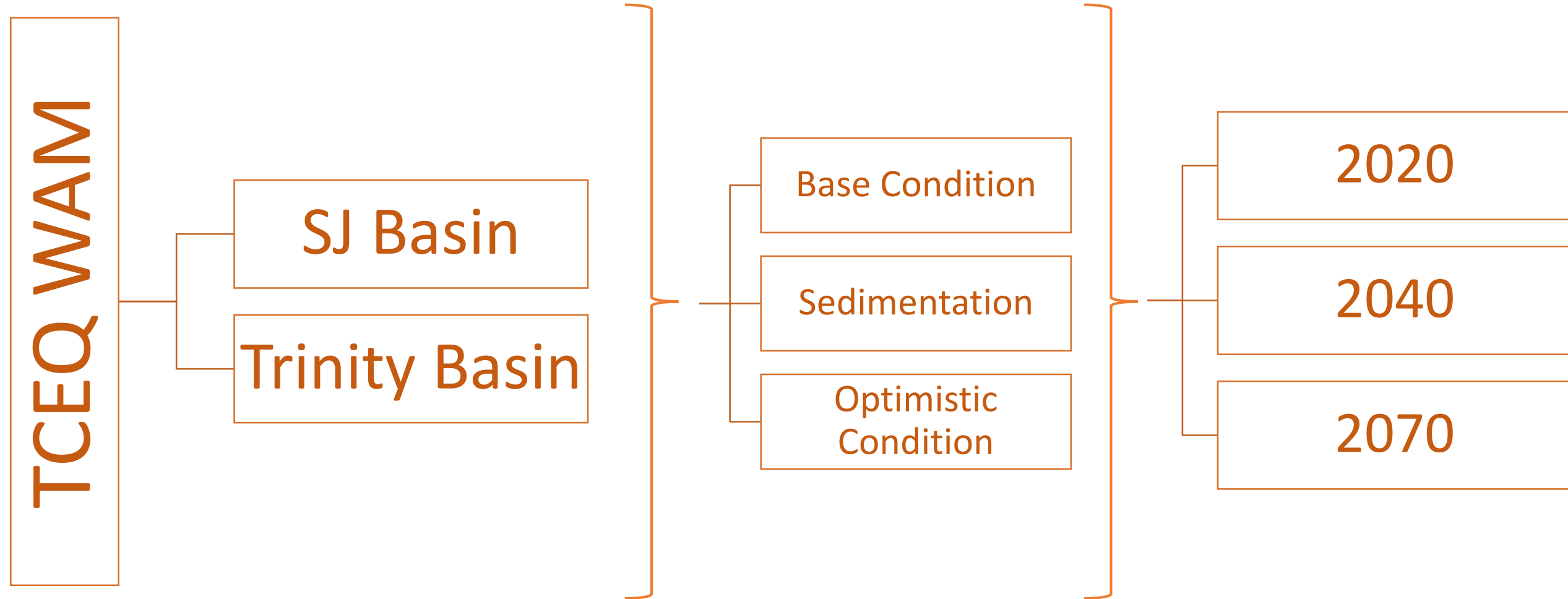
Scenario	Industrial Projection	Irrigation Projection	Municipal Projection
1	Expanded Contracts	Current Contracts	RGUP Pop + Region H GPCD + Region H Manufacturing
2	Expanded Contracts	Current Contracts	RGUP Pop + Region H GPCD + Region H Manufacturing + Baseline Conservation
3	Expanded Contracts	Current Contracts	RGUP Pop + Region H GPCD + Region H Manufacturing + SJRA Conservation



# Supplies

Supply scenario evaluation

# Annual Availability



# SJRA Permits

LAKE CONROE



4963 (100,000 Ac-ft) – Lake Conroe Permit

LAKE  
HOUSTON  
HIGHLANDS



4964 (55,000 Ac-ft) – SJRA Highlands Permit (Backup)



5807 (14,100 Ac-ft) – Lake Houston Additional Authorization (SJRA)



5808 (40,000 Ac-ft) – Excess Flow Permit



5809 (14,944 Ac-ft) – Reuse Permit

TRINITY  
BASIN

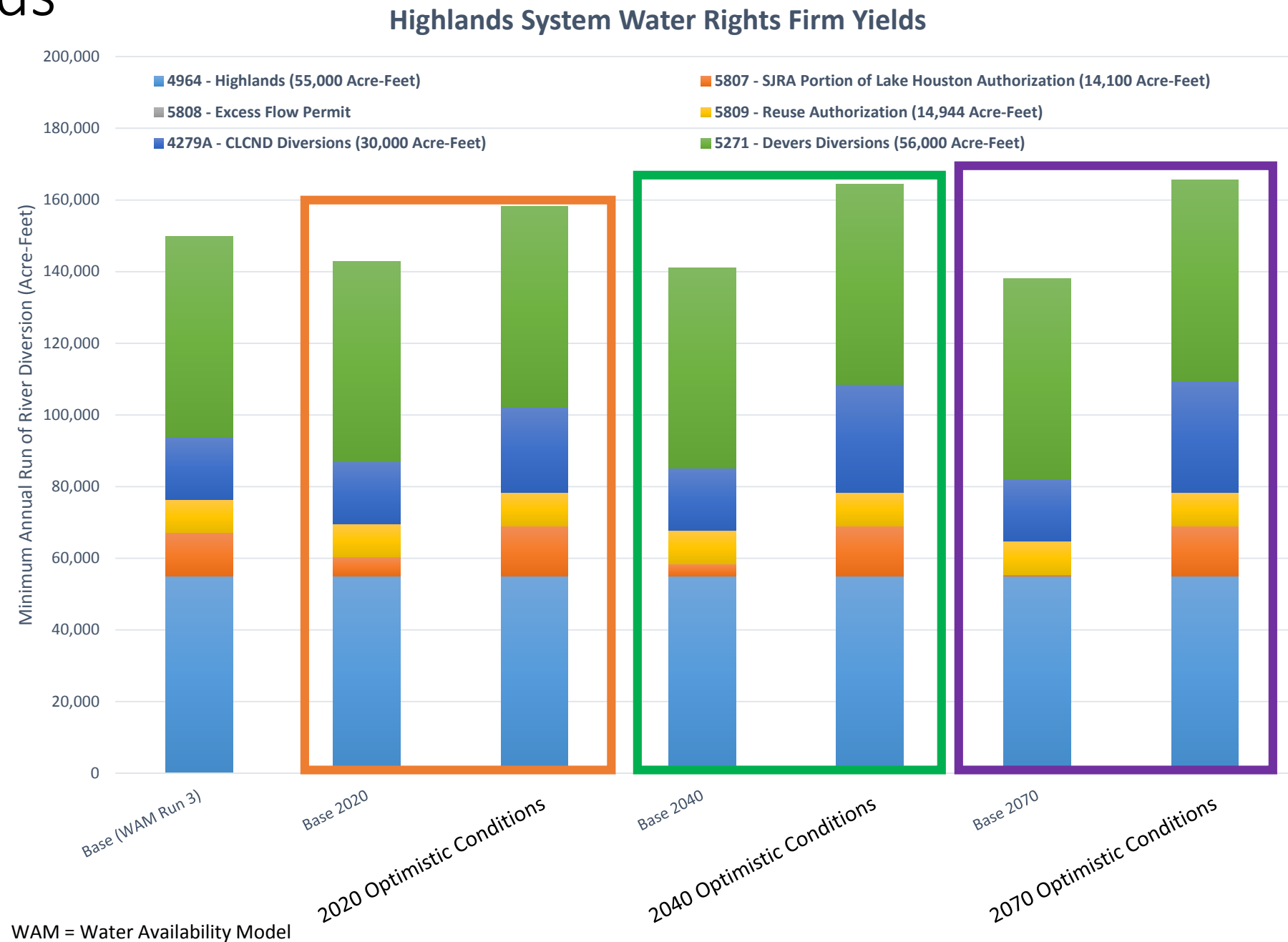


5271 (56,000 Ac-ft) – Devers



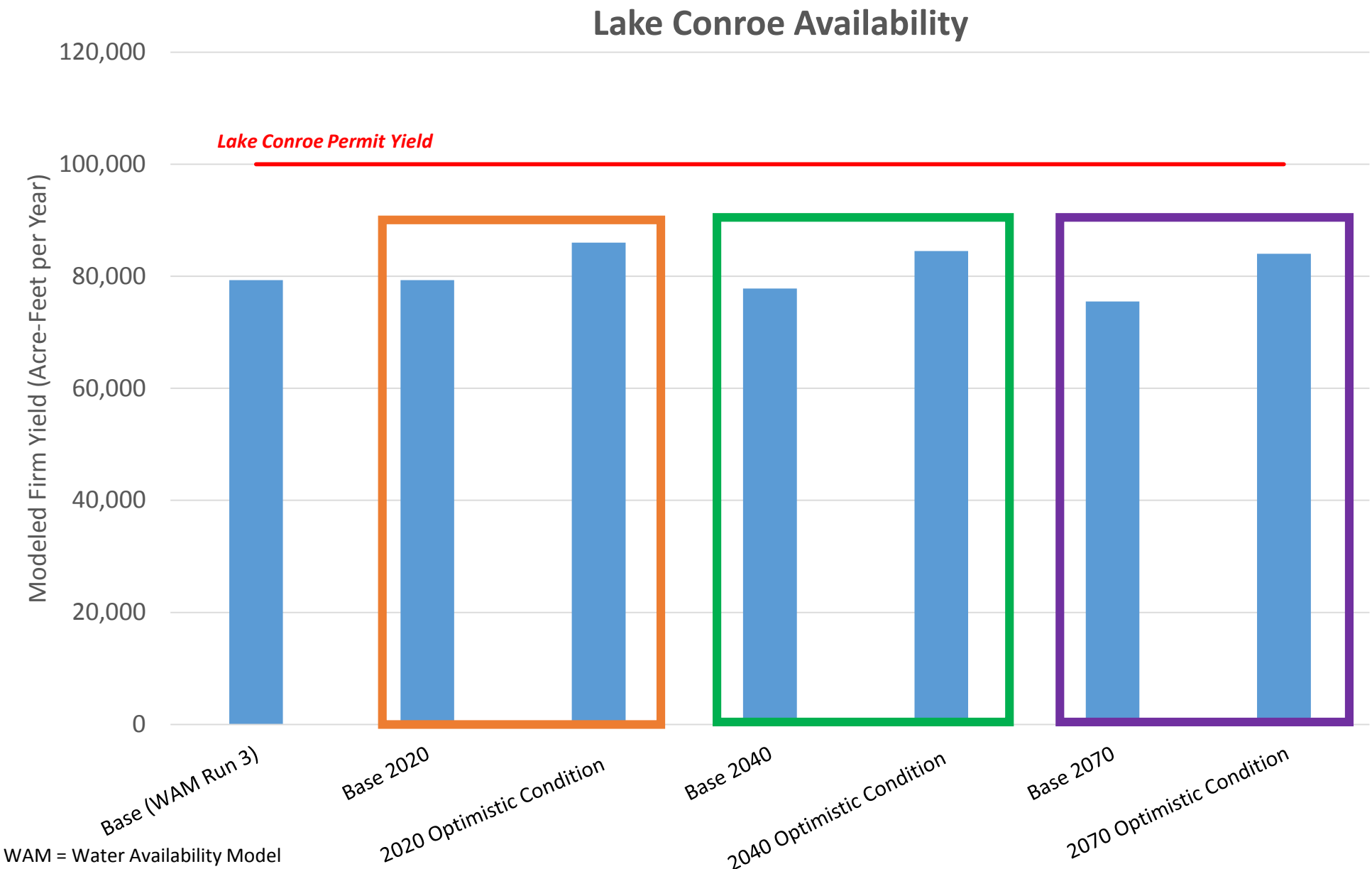
4279A (30,000 Ac-ft) – CLCND

# Results - Highlands





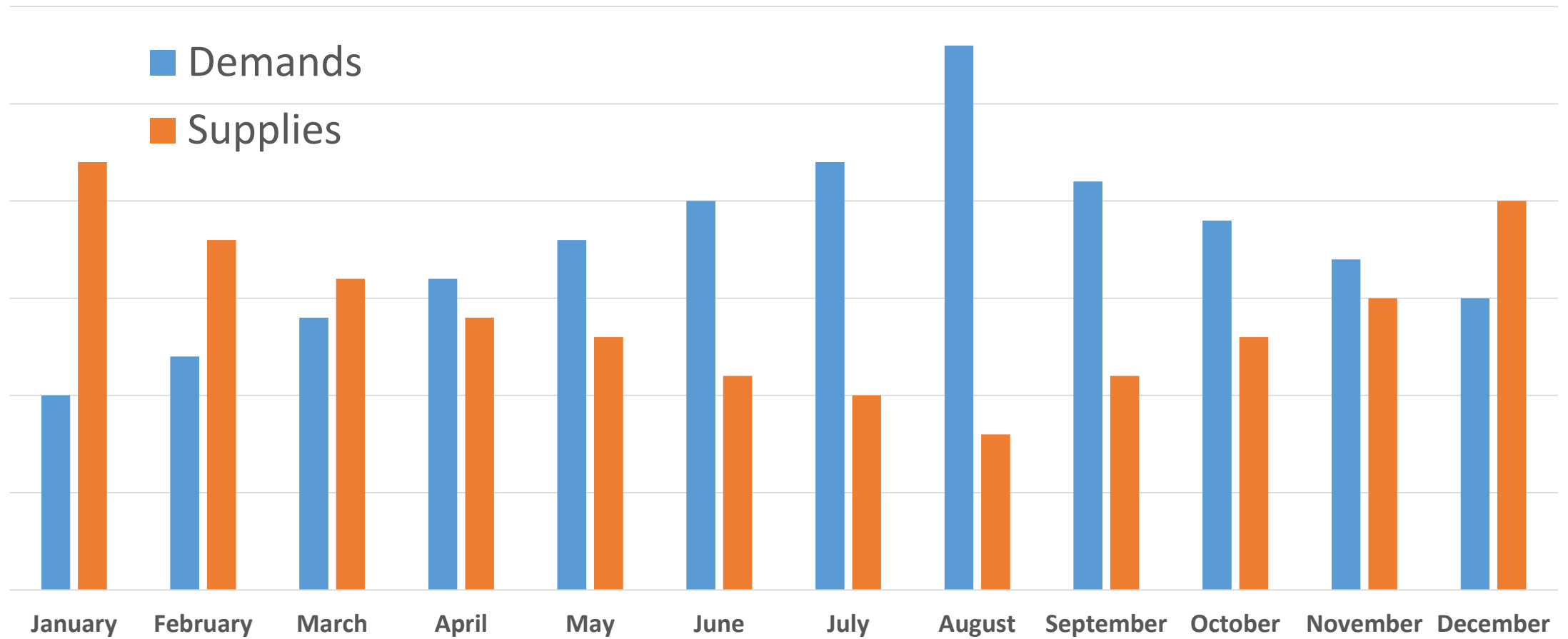
# Results – Montgomery County



# Needs Identification

Needs evaluation

# Supply and Demand Trends



# Needs Analysis Scenarios

## SUPPLIES

BASE (SEDIMENTATION)

OPTIMISTIC CONDITIONS

DROUGHT CONTINGENCY  
OPERATIONS



## DEMANDS

HIGHLANDS

•Two Demand Projections

MONTGOMERY COUNTY

Three Demand Projections



## SURPLUS/NEEDS

HIGHLANDS

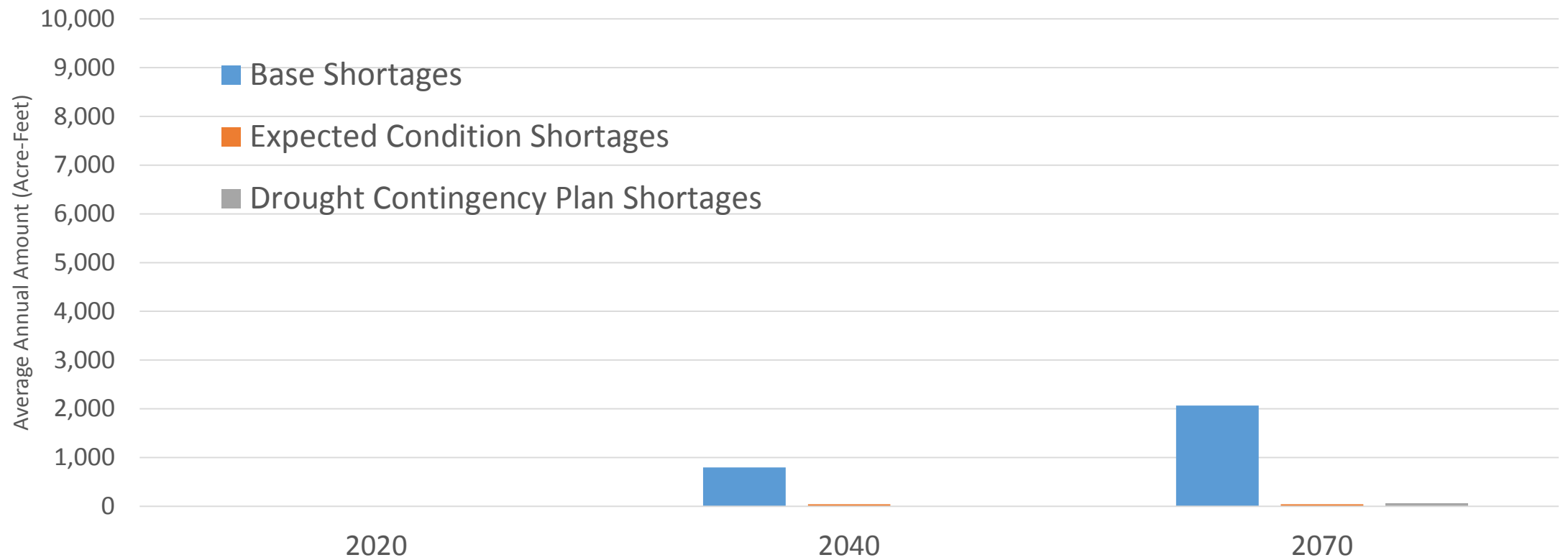
MONTGOMERY COUNTY

# Needs - Summary

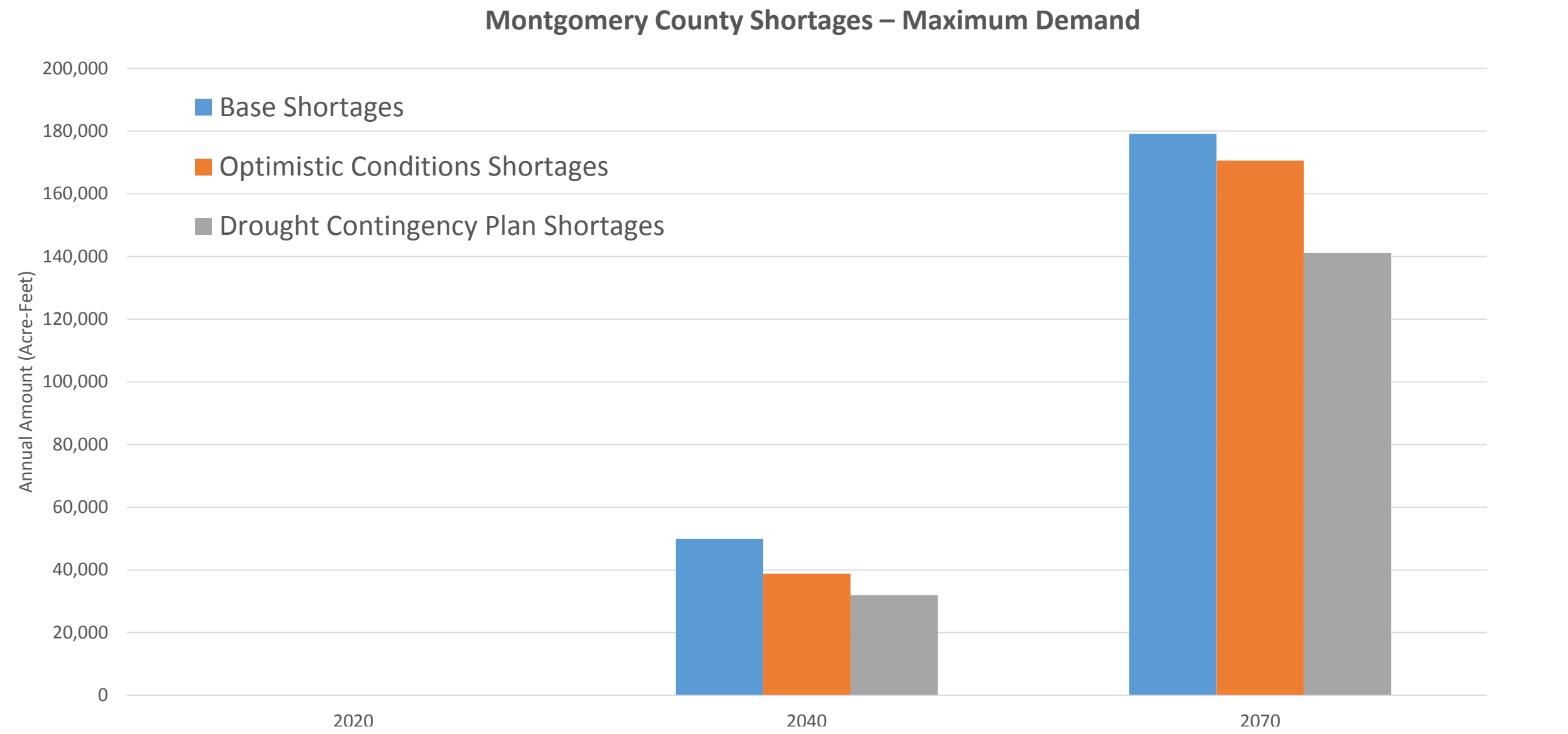
- Needs in both the Highland and Montgomery County systems are important
- Impacts of Optimistic and Drought Contingency scenarios
- Timing of shortages

# Needs - Summary

Highlands Shortages for Maximum Demand



# Needs - Summary



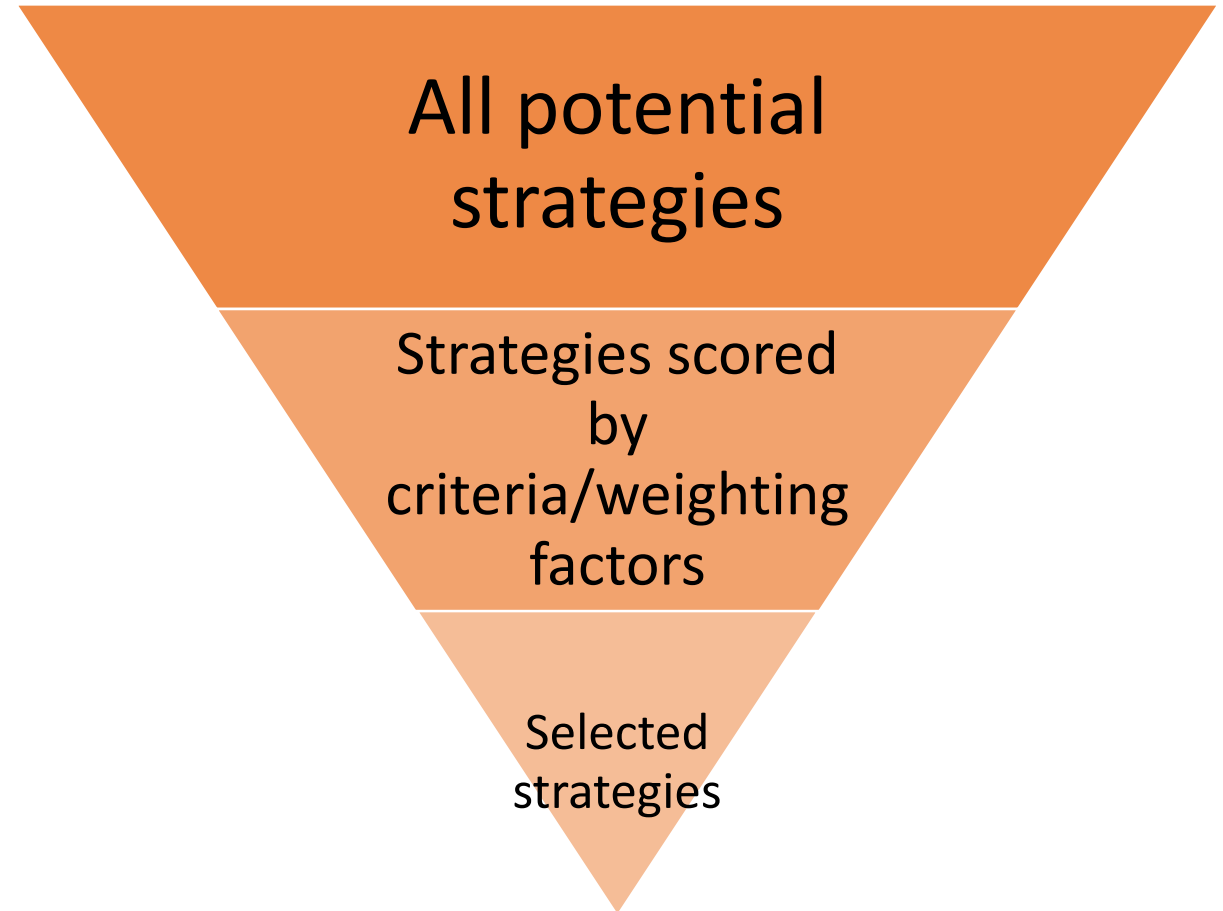
# Water Supply Strategies

Preliminary strategy evaluation



# Strategies - Approach

- Detailed strategy analyses are costly
- High-level screening of universe of potential strategies
  - 14 criteria
  - Weighting factors
- Consistent scoring methodology
  - Existing data
  - Institutional knowledge



# Strategies - Approach

- High-level screening of universe of potential strategies



# Strategies – Scoring

- Developed the screening criteria for comparing potential strategies
- Determined weighting factors of the screening criteria
- Reviewed available literature to collect information related to potential strategies
- Developed strategy scores/ranks

# Strategies – Evaluation Methodology

Criterion	Description	Less Favorable 1	2	3	More Favorable 4
Cooperation	Attributes quality to a project based on the potential for interaction with other entities	Significant potential obstacles in working with other stakeholders to develop project	Potentially some obstacles in working with other stakeholders to develop project	Potentially some opportunity to develop project synergistically with other stakeholders	Significant opportunity to develop project synergistically with other stakeholders
Cost	Preliminary estimated cost of water for a project	>\$1,000 per ac-ft	\$500 to \$1,000 per ac-ft	\$250 to \$500 per ac-ft	<\$250 per ac-ft
Diversification	Scoring based on how likely a project is to provide diversification to the existing SJRA water supply portfolio	Supply originates from sources linked to existing SJRA supplies	Supply originates from sources linked to existing SJRA supplies but may be influenced by other factors	Supply developed from sources unrelated to existing SJRA supplies	Supply developed from a variety of water resource outside of current SJRA portfolio

# Strategies – Evaluation Methodology (cont.)

Criterion	Description	Less Favorable 1	2	3	More Favorable 4
Environmental	Describes the extent of environmental impacts required for implementation of a project	Significant environmental impact is expected; significant environmental studies and mitigation may be required	Some notable environmental impact; uncertain course for studies and mitigation	Some notable environmental impact; routine process for permitting	Minor environmental impact; environmental studies have been completed on similar projects
Funding	Related to the ease at which alternative funding may be obtained for the project and if special incentives may be available for project development	No obvious potential opportunities for funding	Common funding mechanisms may be utilized; project will compete equally with other competing projects	Specialized funding mechanisms exist	Project will receive beneficial consideration in a funding program due to type of project or source of water
Land Acquisition	Refers to the number of land acres that must be acquired in order to implement the project	Significant land impact (> 1,000 ac)	100-1,000 ac	5-100 ac	Minimal land impact (<5 ac)

# Strategies – Evaluation Methodology (cont.)

Criterion	Description	Less Favorable 1	2	3	More Favorable 4
Legal	Defines the level of legal obstacles that must be overcome in implementing the project	Significant permitting required; extensive contracting progress	Moderate level of permitting and contracting; several unknowns	Moderate level of permitting and contracting; few unknowns	Minimal permitting required; simple contracting
Location	Related to the location of the developed supply and proximity to potential demands served	IBT required, long distance from SJRA service area	IBT required to meet the majority of identified needs	Some conveyance required to meet identified demands	Limited conveyance needs
Magnitude	Describes the potential yield of a strategy.	<5,000 ac-ft/yr	5,000 to 25,000 ac-ft/yr	25,000 to 50,000 ac-ft/yr	>50,000 ac-ft/yr

# Strategies – Evaluation Methodology (cont.)

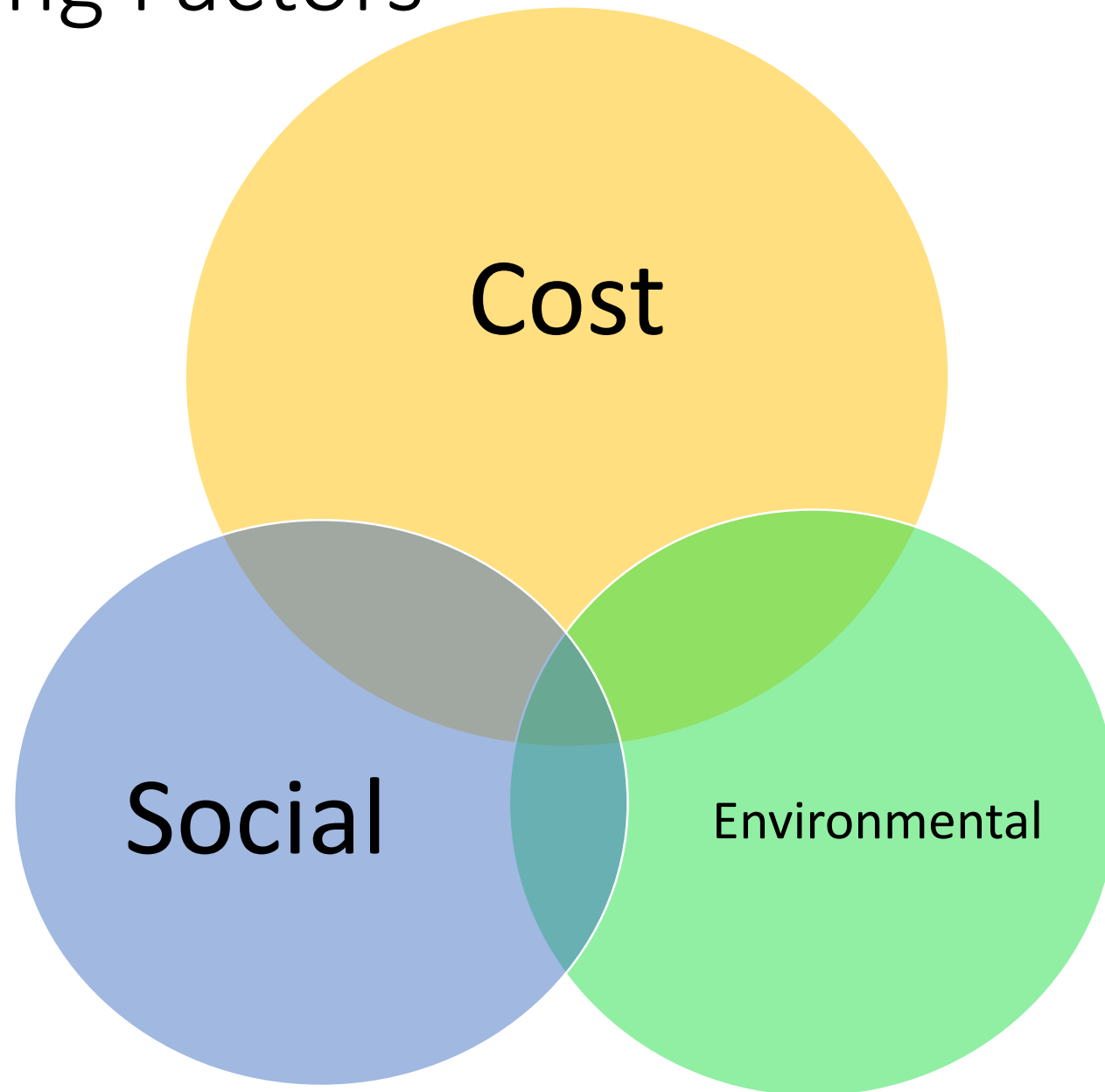
Criterion	Criteria Weighting Factor	Less Favorable 1	2	3	More Favorable 4
Other Supplies	Defines how the project interacts with other projects or existing supplies in either preventing the development of other alternatives or enhancing the yield of existing or future supplies	Negative impacts to existing and other potential supplies	Negative impacts to other potential projects	Opportunity to enhance other potential projects	Opportunity to enhance existing supplies and other potential supplies
Public	Describes the public support or potential opposition for a project concept.	No local support; significant opposition	Minimal local support; some opposition	Local support; minimal opposition	Widespread local support; opportunity for ancillary community benefits
Scalability	Defines the ability of a project to be implemented by smaller stakeholders in partnership with SJRA	Project requires significant infrastructure and development by a major sponsor	Project may be implemented by a small number of larger customers	Project may be implemented by most existing and potential customers	Project can be implemented by utilities of all sizes

# Strategies – Evaluation Methodology (cont.)

Criterion	Criteria Weighting Factor	Less Favorable 1	2	3	More Favorable 4
Schedule	Defines the anticipated schedule for development of a project	>30 years	15-30 years	5 to 15 years	0 to 5 years
Yield Risk	Determined by the risk associated with a potential project's yield being reduced due to regulatory or environmental issues	High level of uncertainty that project yield will be maintained in the long term	Moderate risk that a project's yield will diminish over time	Some risk of reduction to project yield	Virtually no risk of project yield being reduced over time



# Strategy Weighting Factors



# Strategy Weighting Factors

Number	Factor	Weight
1	Cooperation	4
2	Cost	40
3	Diversification	2
4	Environmental	6
5	Funding	4
6	Land Acquisition	4
7	Legal	6
8	Location	6
9	Magnitude	4
10	Other Supplies	2
11	Public	6
12	Scalability	4
13	Schedule	6
14	Yield Risk	6
TOTAL		100

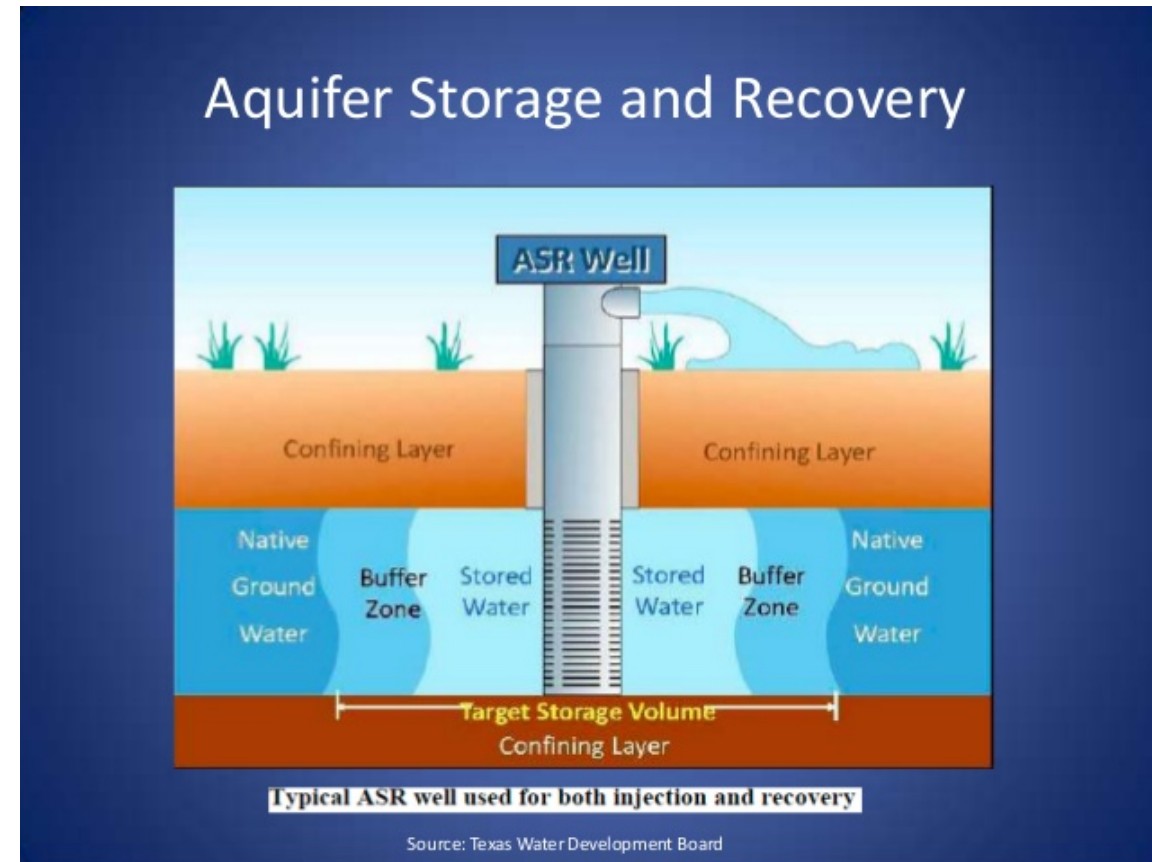
# Identified Strategies

Name	Details
Aquifer Storage and Recovery	Developed by SJRA Customers
	Developed by SJRA (GRP Treated)
	Developed by SJRA (Mildly Treated)
Bedias Reservoir	
Brazos River Supplies	
Catahoula Aquifer Supplies	Developed by SJRA Customers (Treated)
	Developed by SJRA Customers (Blended)
	Developed by SJRA (Lake Conroe)
	Developed by SJRA (Treated)
	Developed by SJRA (Blended)
Conservation	TWDB Baseline
	SJRA Recommendations
Direct Reuse	GRP Participants
	Woodlands
East Texas Water Transfer	Neches Basin
	Sabine Basin
Increase Lake Conroe Pool Elevation	

Name	Details
Lake Creek Reservoir	
Lake Creek Scalping	Run-of-River Diversion
	Storage in Lake Conroe
	Dedicated Storage
Lake Livingston Transfer	Livingston to Conroe
	Livingston to Highlands
Purchase Groundwater	Purchase from Eastern Basins
	Purchase from Western Basins
Purchase Surface Water	TRA
	CLCND
	COH
Regional Return Flows	Lake Conroe
	Lake Houston
	Lake Houston w/ South Plant
Seawater Desalination	
Trinity Return Flows	

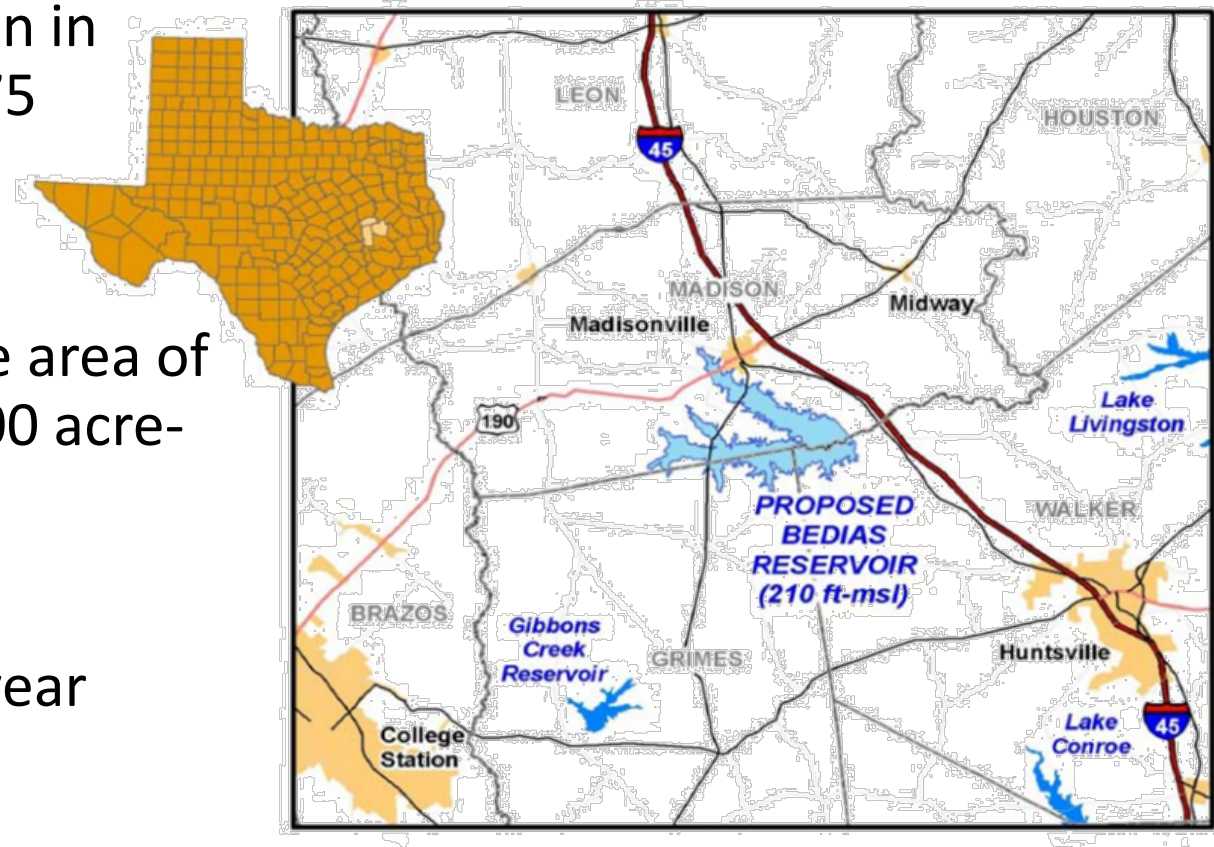
# Strategies – Aquifer Storage and Recovery

- Strategy used to inject, store, and later recover water when needed
- Sources of supply for ASR
  - Raw and finished groundwater
  - Untreated, partially treated, and finished surface water
  - Treated reuse water
- ASR strategy can be developed by
  - SJRA (Mildly Treated)
  - SJRA GRP (Treated)
  - SJRA Customers



# Strategies – Bédias Reservoir

- Reservoir site located in the Trinity River Basin in Madison County, several miles west of Hwy 75 crossing
- Includes Bédias and Caney Creeks, a drainage area of 395 sq. miles, conservation storage of 192,700 acre-feet
- Yield of approximately 75,000 acre-feet per year
- Needs an inter-basin transfer to Montgomery County and transmission system to either Highlands or Montgomery County service area



# Strategies – Brazos River Supplies

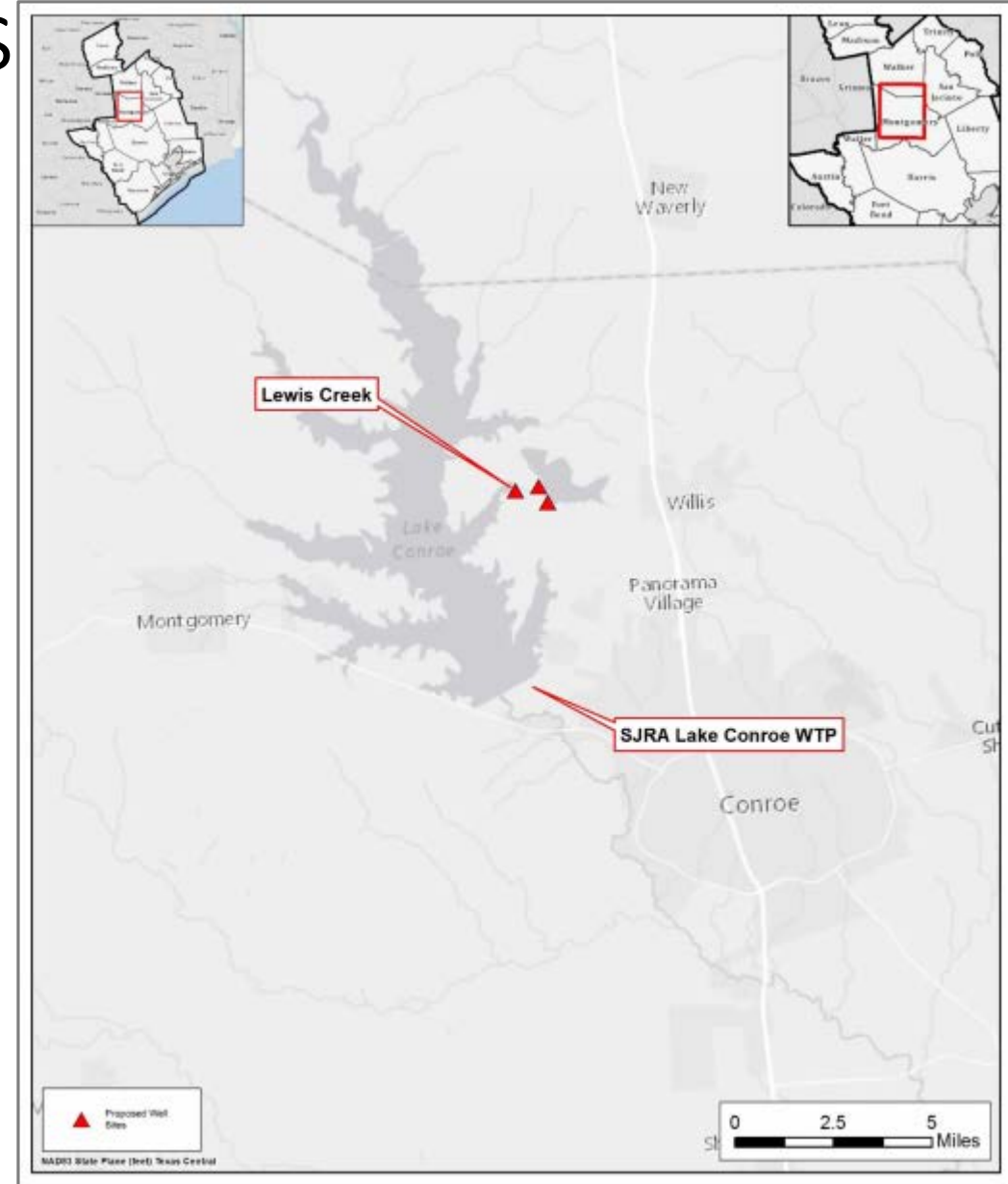
- Strategy includes contracting with Brazos River Authority for surface water supplies
- Additional supplies potentially available from systems operations permit (when approved)
- Yield of approximately 25,000 acre-feet per year
- Needs an inter-basin transfer to Montgomery County and transmission system to either Highlands or Montgomery County service area





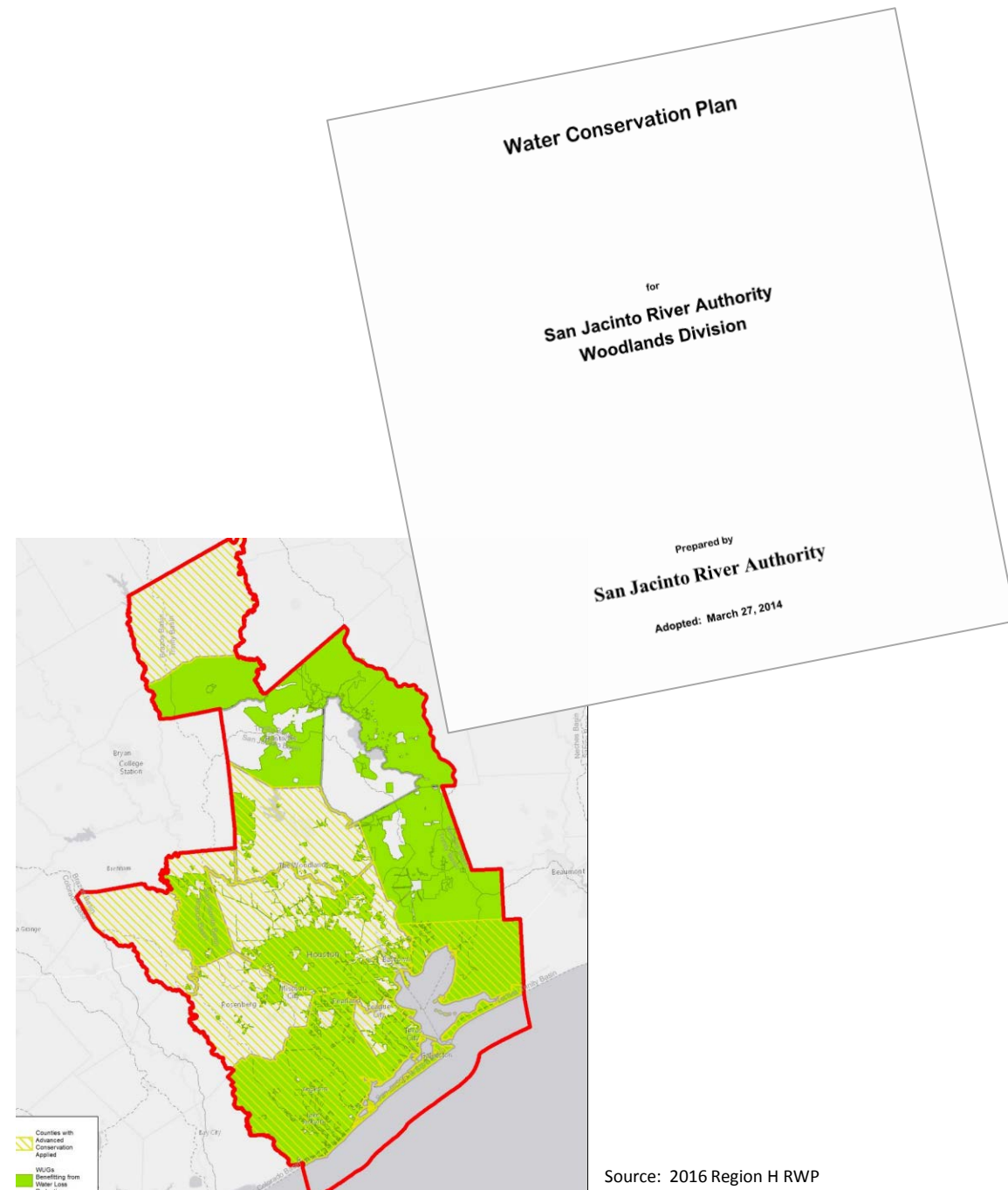
# Strategies – Catahoula Supplies

- Development of groundwater wells in the Catahoula aquifer in Montgomery County
- Project can be developed by
  - SJRA Customer (Treated)
  - SJRA Customer (Blended)
  - SJRA (Lake Conroe)
  - SJRA (Treated)
  - SJRA (Blended)
- Yield of approximately 8,000 acre-feet per year



# Strategies – Conservation

- Conservation decreases or attenuates future supply needs through demand reduction
- Project can be developed as
  - Baseline conservation (TWDB Guidelines)
  - SJRA conservation plan recommendations
- Baseline conservation included in the demand projections for the region
- SJRA conservation plan highlights advanced and aggressive initiatives with a goal to reduce demands by one percent every year

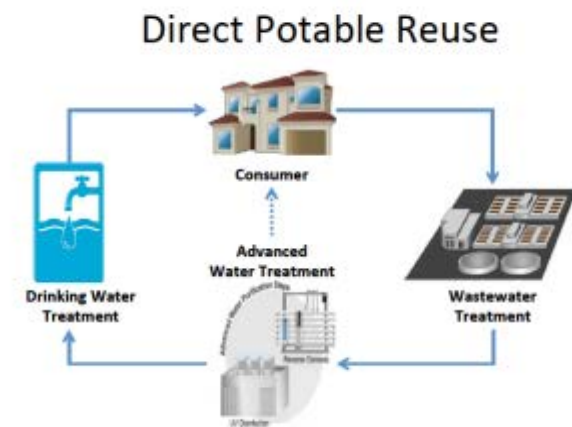
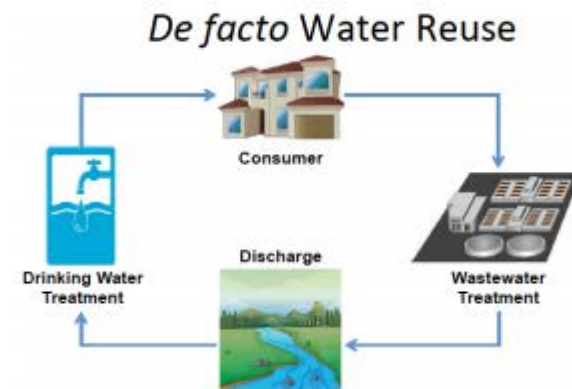


Source: 2016 Region H RWP



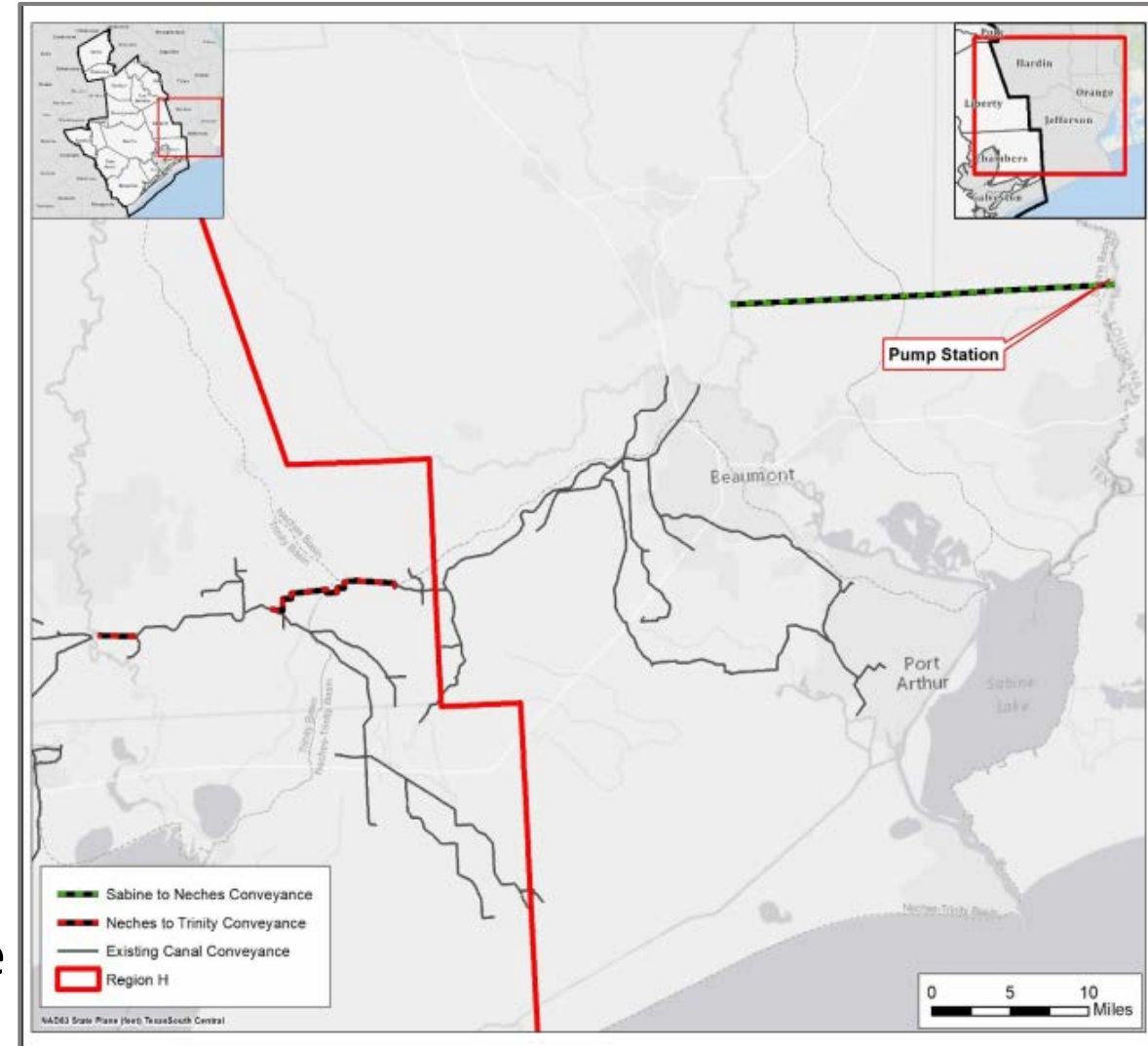
# Strategies – Direct Reuse

- Strategy utilizing treated wastewater effluent to meet water demand
- Direct reuse involves conveyance of treated effluent by means of a pipe
- Project can be developed by
  - SJRA GRP participants
  - SJRA customers (Woodlands)
- Transmission and distribution system infrastructure required to convey the direct reuse supplies to point of use



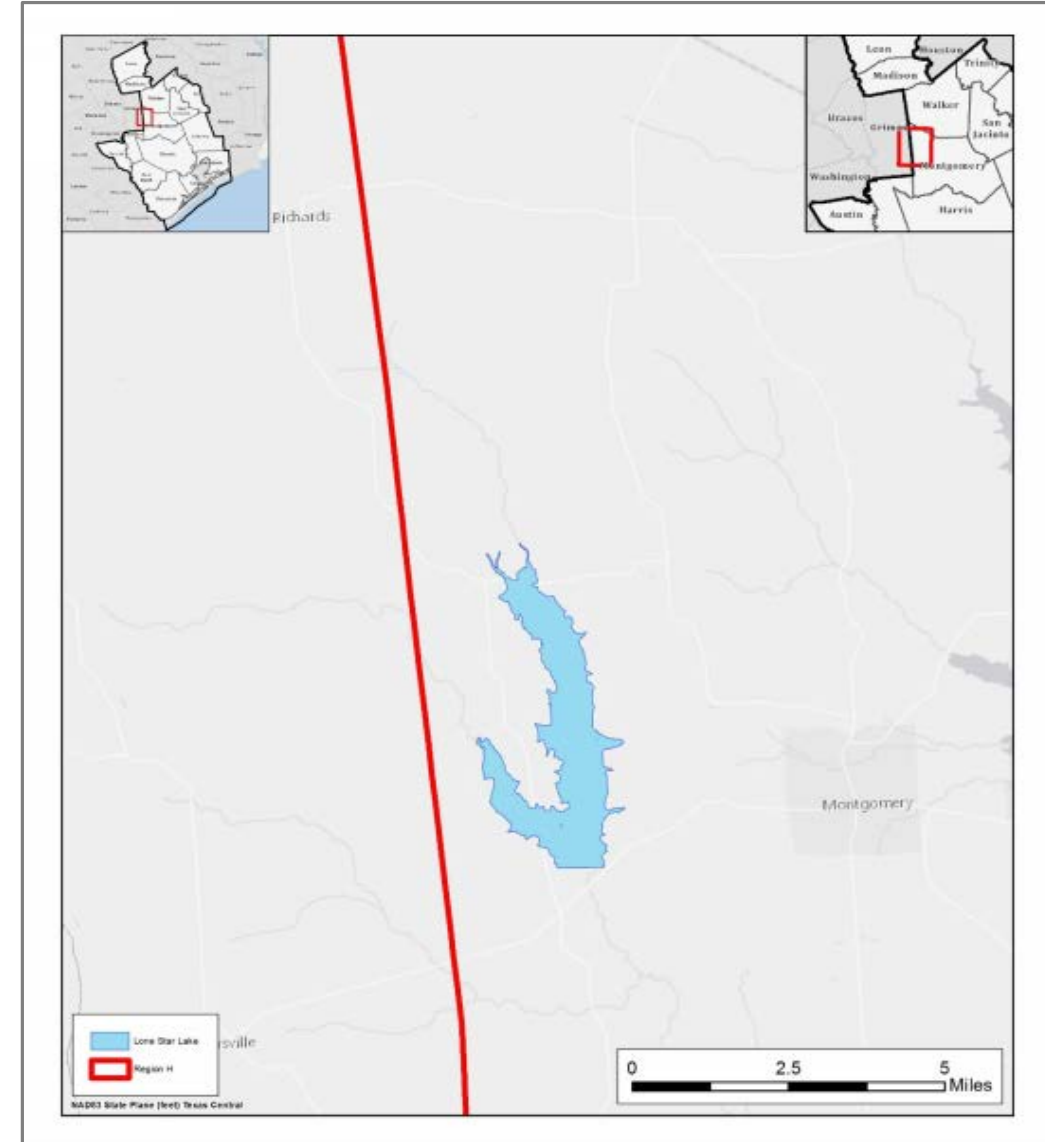
# Strategies – East Texas Transfer

- Transmission of water from East Texas through canal and pipeline conveyance to the diversion points in the Trinity and San Jacinto Basins
- Up to 250,000 acre-feet per year of supplies available
- Inter-basin transfer required to transfer the supplies to Montgomery County and Highlands system
- Transmission and distribution system infrastructure required to convey the direct reuse supplies to point of use



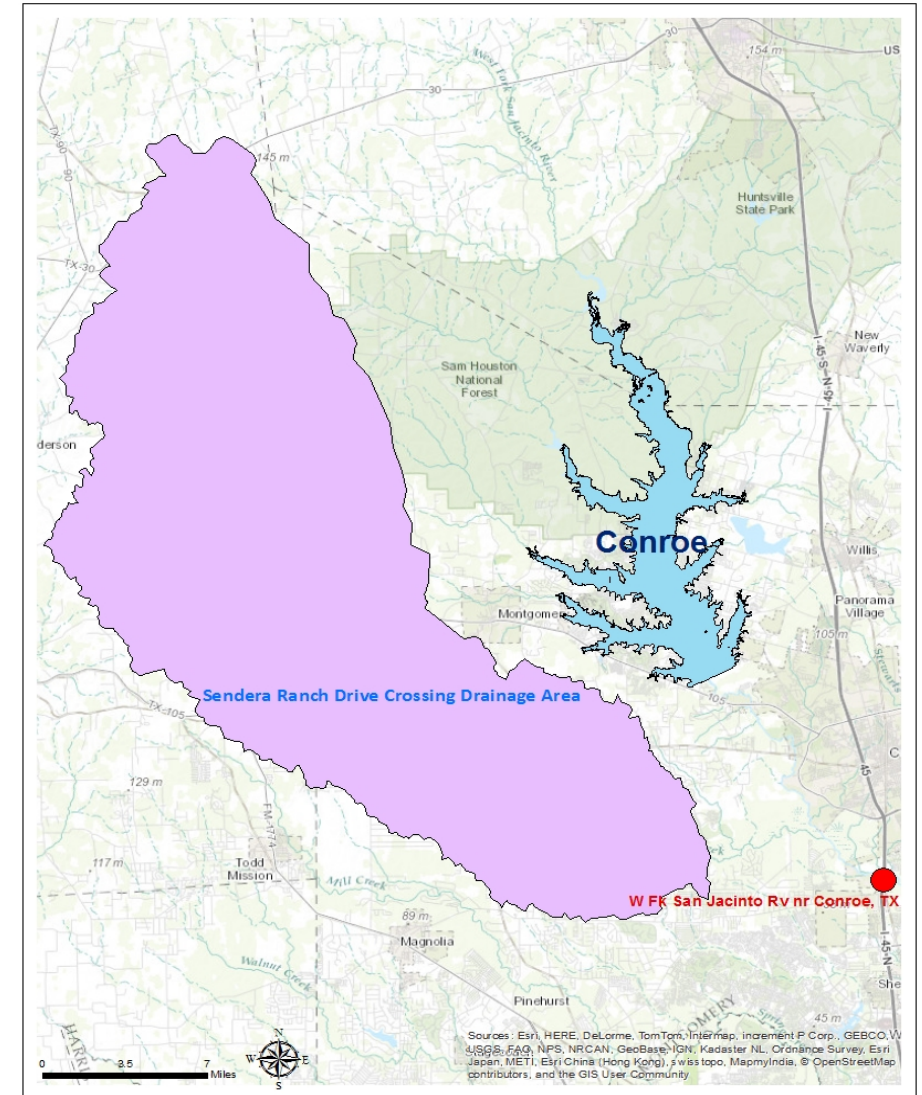
# Strategies – Lake Creek Reservoir

- Lake Creek located on the southwest side of Lake Conroe joining the west fork of San Jacinto River below the confluence of Lake Conroe
- Conceptual site for Lake Creek is five miles southwest of Lake Conroe
- Up to 67,200 acre-feet per year of supplies available
- Transmission system infrastructure required to convey the supplies to SJRA's Montgomery County system



# Strategies – Lake Creek Scalping

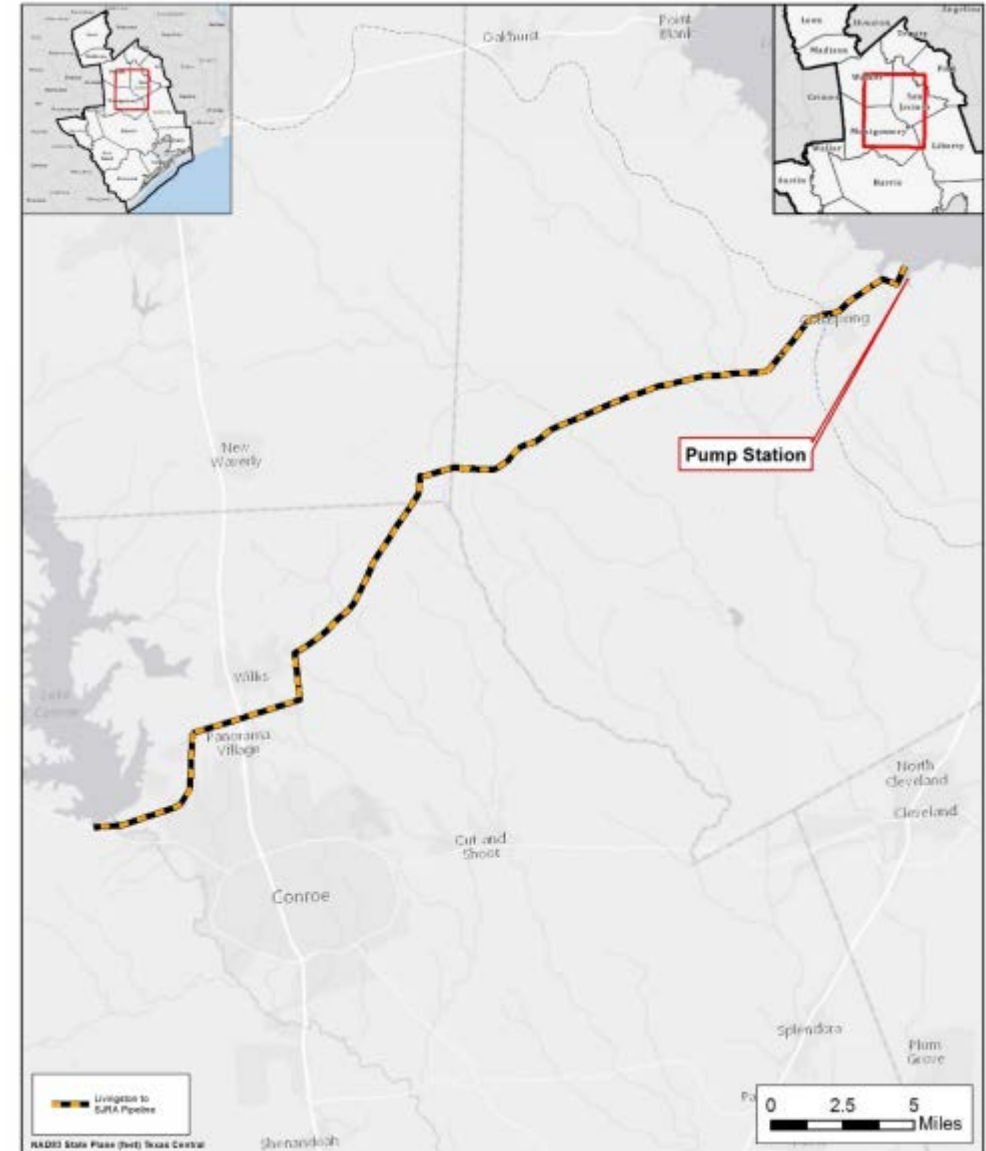
- Lake Creek located on the southwest side of Lake Conroe, joining the West Fork of San Jacinto River below the confluence of Lake Conroe
- SJRA evaluated various options for scalped supplies from Lake Creek
- Up to 10,000 acre-feet per year of supplies available
- Project can be developed as
  - Run-of-river diversion
  - Storage in Lake Conroe
  - Dedicated storage (off-channel)





# Strategies – Lake Livingston Transfer

- SJRA signed an agreement with TRA for option to purchase 50,000 acre-feet per year of water from TRA's existing supplies in Lake Livingston
- Transmission used to deliver SJRA's Trinity run-of-river rights can also be used to deliver Livingston supplies in Highlands system
- New transmission system required to move supplies to Montgomery County system
- Inter-basin transfer required for the Montgomery County system



# Strategies – Purchase Surface & Groundwater

- Contract to purchase groundwater from basins east and west of SJRA service area
- Contract to purchase additional surface water from providers such as TRA or CLCND
- New transmission system required to move supplies to Montgomery County system

# Strategies – Seawater Desalination

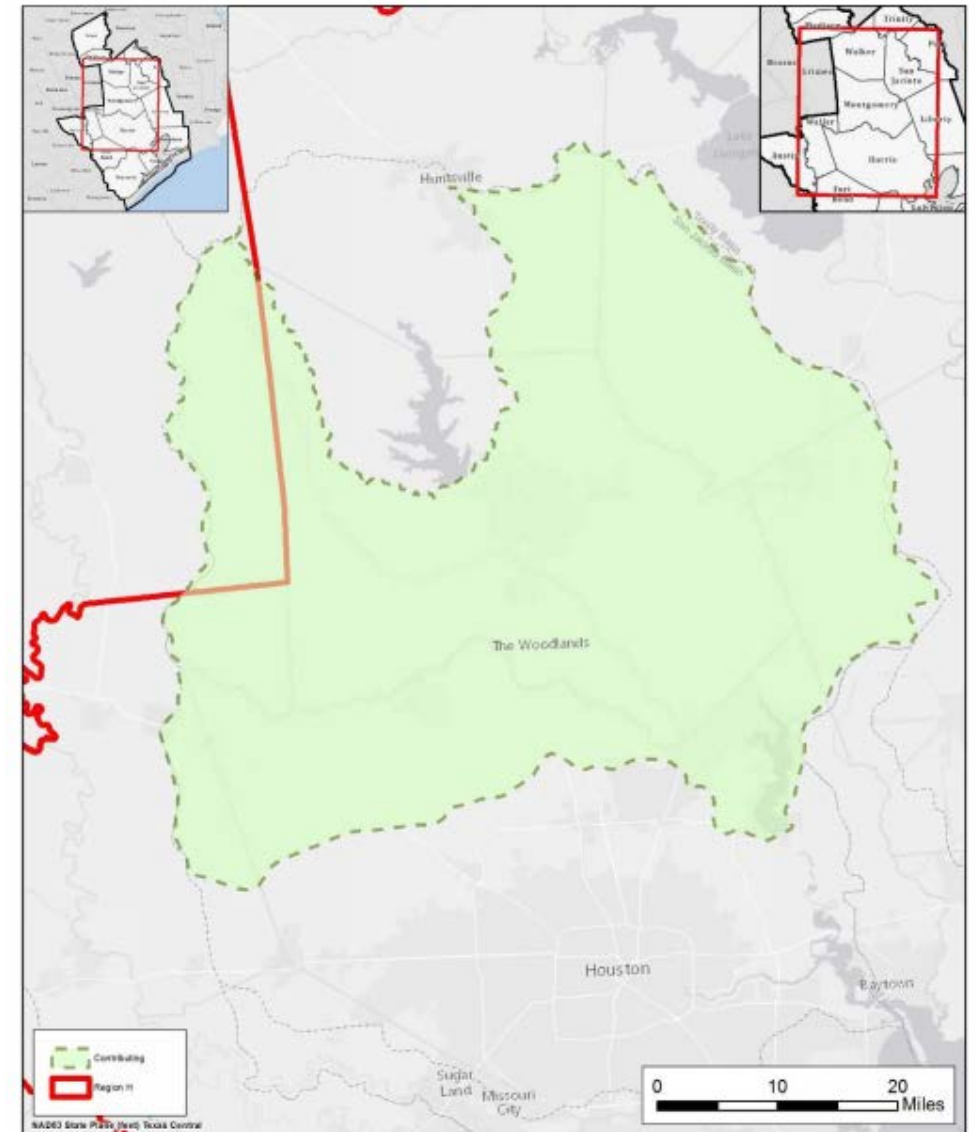
- Regional studies focused on potential desalination plant near the Dow facility in Freeport
- Ideal site location
  - With access to saline and fresh water sources
  - Pre-existing permits for withdrawals and discharge
  - Pre-existing infrastructure
  - Discharge into Gulf of Mexico
- New transmission system required to move supplies to Montgomery County system
- Strategy preferable for Highlands system due to the proximity



Source: [www.kxan.com](http://www.kxan.com)

# Strategies – Regional Return Flows

- Projected population growth in Montgomery and Harris Counties result in significant return flows
- Project can be developed as
  - Capture return flows in Montgomery County and transfer to Lake Conroe for treatment at GRP treatment plant
  - Capture return flows in Lake Houston watershed and transfer to Lake Houston for use in Highlands system
  - Capture return flows in Lake Houston watershed for treatment at new South Montgomery County treatment plant for use by GRP customers
- New transmission system required to move supplies to customers





# Strategies – Increase Lake Conroe Pool

- SJRA can apply for a permit to increase Lake Conroe conservation pool
- Additional supply can be captured-runoff, additional groundwater supplies, or transfer from other surface water supplies
- Permit potentially subject to TCEQ environmental flow requirements
- Project suitable for Montgomery County customers

# CONSERVATION – TEXAS WATER DEVELOPMENT BOARD RECOMMENDATIONS

	Montgomery County		
	Criteria Score		Explanation
Cooperation	3	Potentially some opportunity to develop project synergistically with other stakeholders	RWP 2016: Requires coordination between small systems on conservation plans and attitudes.
Cost	4	<\$250 per ac-ft	2016 RWP: Based on anticipated installation of efficient plumbing fixtures and appliances (no cost) ; Water conservation approaches consistently achieve high scores related to cost. This is particularly affordable considering these projects offset the cost of treated, municipal supply.
Diversification	3	Supply developed from sources unrelated to existing SJRA supplies	2016 RWP: Does not add another source of water, but instead decreases demand and reliance on existing sources.
Environmental	4	Minor environmental impact; environmental studies have been completed on similar projects	2016 RWP: Generally, there are no significant negative environmental impacts associated with the conservation projects or that may results from implementation of the conservation management project.
Funding	4	Project will receive beneficial consideration in a funding program due to type of project or source of water	2016 RWP: Although sponsors are identified, commitment to implementation varies considerably. Dedicated SWIFT funds are available through the TWDB funding program.
Land Acquisition	4	Minimal land impact (<5 ac)	No applicable cost.
Legal	3	Moderate level of permitting and contracting; few unknowns	2016 RWP: Requires identifying utility to manage conservations measures.

Montgomery County			
Criteria Score			Explanation
Location	4	Limited conveyance needs	n/a
Magnitude	2	5,000 to 25,000 ac-ft per year	6,000 (2020) – 30,000 (2070) ac-ft/yr
Other Supplies	2	Negative impacts to other potential projects	2016 RWP: Conservation may negatively impact the availability of return flows for development into indirect reuse projects.
Public	4	Widespread local support; opportunity for ancillary community benefits	2016 RWP: No opposition to conservation efforts. Local support to initiatives
Scalability	4	Project can be implemented by utilities of all sizes	2016 RWP: Can be implemented at every level.
Schedule	3	5 to 15 years	2016 RWP: 2020 with ongoing annual expenditures; Conservation programs can be implemented in a relatively short period of time.
Yield Risk	3	Some risk of reduction to project yield	Uncertain near and long-term efficiency.
	364		Montgomery County Score

## HIGHLANDS STRATEGIES RANKING

Number	Rank	Name	Sub-Type
1	1	Lake Livingston Transfer	
2	2	Purchase Surface Water	TRA
3	3	Trinity Return Flows	
4	4	Regional Return Flows	Lake Houston
5	5	Purchase Surface Water	CLCND
6	6	Purchase Groundwater	Purchase from Eastern Basins
7	6	Purchase Groundwater	Purchase from Western Basins
8	8	East Texas Water Transfer	Neches Basin
9	8	East Texas Water Transfer	Sabine Basin
10	10	Seawater Desalination	
11	11	Lake Creek Reservoir	
12	12	Bedias Reservoir	
13	13	Brazos River Supplies	

# MONTGOMERY COUNTY STRATEGIES RANKING

Number	Rank	Name	Sub-Type
1	1	Conservation	TWDB Baseline
2	2	Catahoula Aquifer Supplies	Developed by SJRA Customers (Blended)
3	3	Conservation	SJRA Water Conservation Plan
4	4	Regional Return Flows	Lake Conroe
5	5	Direct Reuse, Non-Potable	GRP Participants
6	6	Direct Reuse, Non-Potable	Woodlands
7	7	Catahoula Aquifer Supplies	Developed by SJRA (Lake Conroe)
8	8	Catahoula Aquifer Supplies	Developed by SJRA Customers (Treated)
9	9	Catahoula Aquifer Supplies	Developed by SJRA (Blended)
10	10	Lake Livingston Transfer	Livingston to Conroe
11	10	Purchase Surface Water	TRA
12	12	Aquifer Storage and Recovery	Developed by SJRA Customers
13	13	Purchase Groundwater	Purchase from Eastern Basins
14	13	Purchase Groundwater	Purchase from Western Basins
15	15	Aquifer Storage and Recovery	Developed by SJRA (Mildly Treated)
16	15	Catahoula Aquifer Supplies	Developed by SJRA (Treated)
17	17	Aquifer Storage and Recovery	Developed by SJRA (GRP Treated)
18	18	Lake Creek Scalping	Storage in Lake Conroe
19	19	Lake Creek Scalping	Run-of-River Diversion
20	19	Lake Creek Scalping	Dedicated Storage
21	21	Lake Creek Reservoir	
22	21	Regional Return Flows	Lake Houston w/ South Plant
23	23	Brazos River Supplies	
24	24	East Texas Water Transfer	Neches Basin
25	24	East Texas Water Transfer	Sabine Basin
26	26	Increase Lake Conroe Conservation Pool	
27	27	Bedias Reservoir	
28	27	Seawater Desalination	

# Next Steps

- Strategy analysis
  - Select strategies for detailed evaluation
  - Develop strategy implementation plan (next phase)

Next Stakeholder Meeting

Questions??