Long Range Water Supply Plan

Forney Dam at Lake Ray Hubbard

Society of American Military Engineers' Dallas Post

December 4, 2014

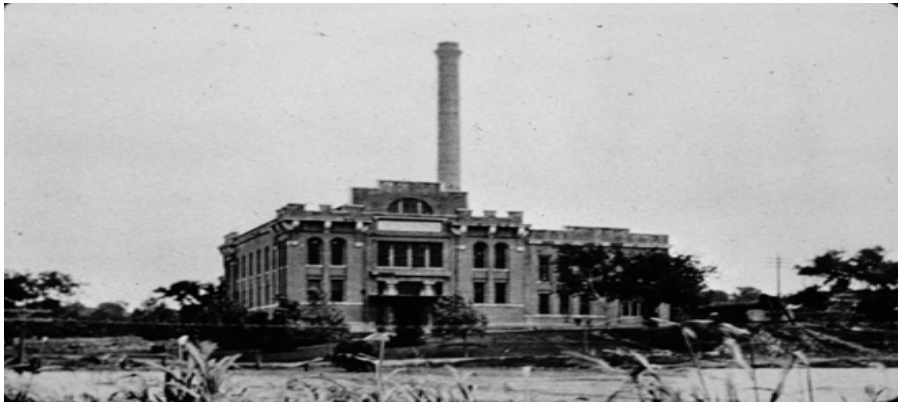
UT Arlington – E. H. Hereford University Center

Outline

- Background
- Water Supply Planning
- Long Range Water Supply Plan
  - Projected Demands
  - Current Supplies
  - Projected Needs
- LRWSP Preferred Water Management Strategies

Background

Change in Water Utilities Operations



Turtle Creek Pump Station (1909-1930)

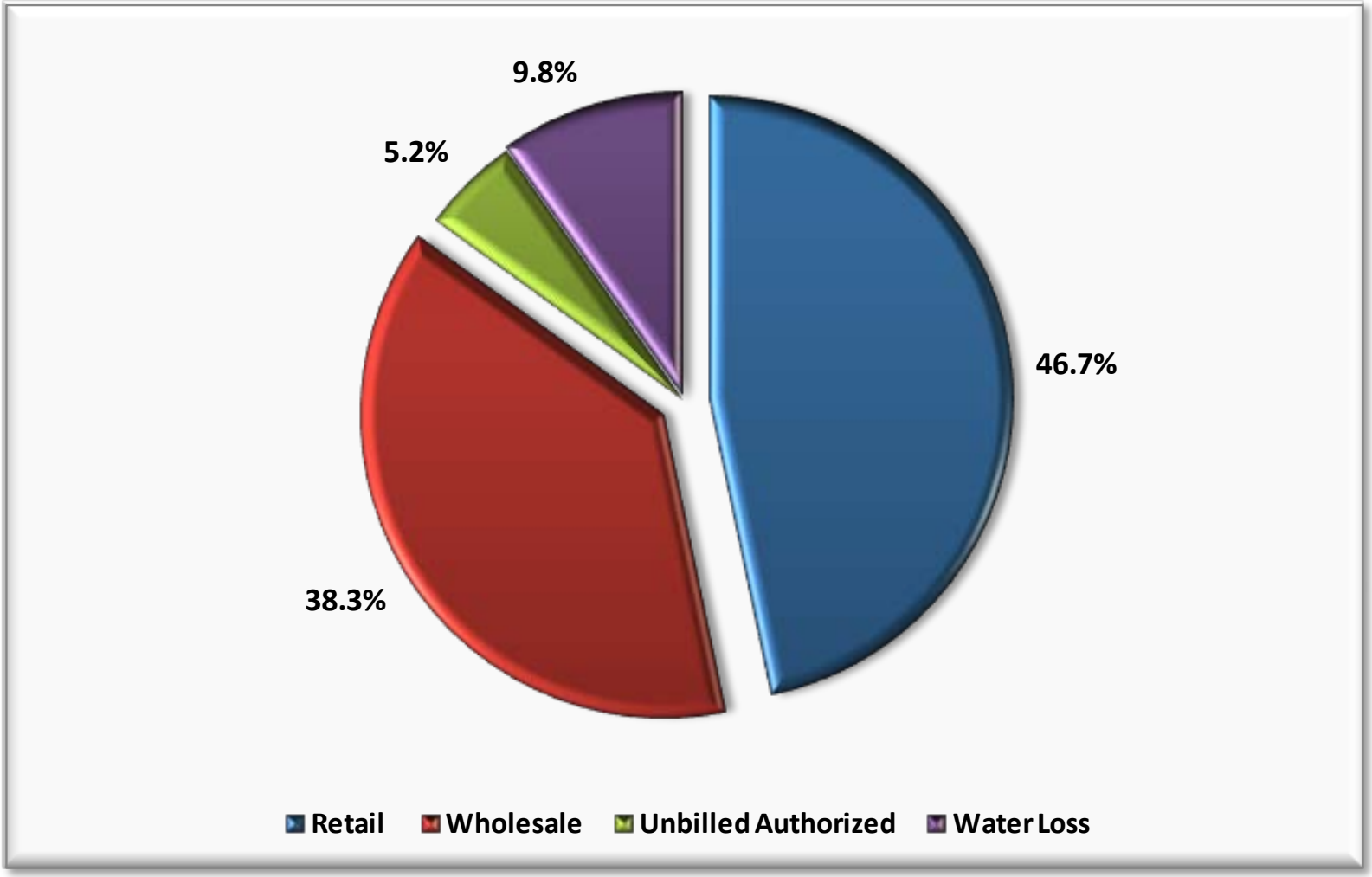
1850s-1950	1950 to 2010	2010 to 2070 and Beyond
- Population grew from 430 to 400,000 in 100 yrs	- Service population grew from 400,000 to 2.4 million in 60 yrs	- Service population to grow to over 4.5 million
- Surface water and wells used for water supply	- Only surface water used for water supply	- Increased reliance on conservation/reuse
- 2 small lakes (Lake Dallas and White Rock Lake)	- 7 lakes for water supply; 6 connected, 1 currently unconnected	- 9 lakes possible for water supply
- Declining block rate used	- Aggressive water conservation measures implemented	- Increasing block rate used
	- Increasing block rate used	

City of Dallas Water Utilities Fact Sheet

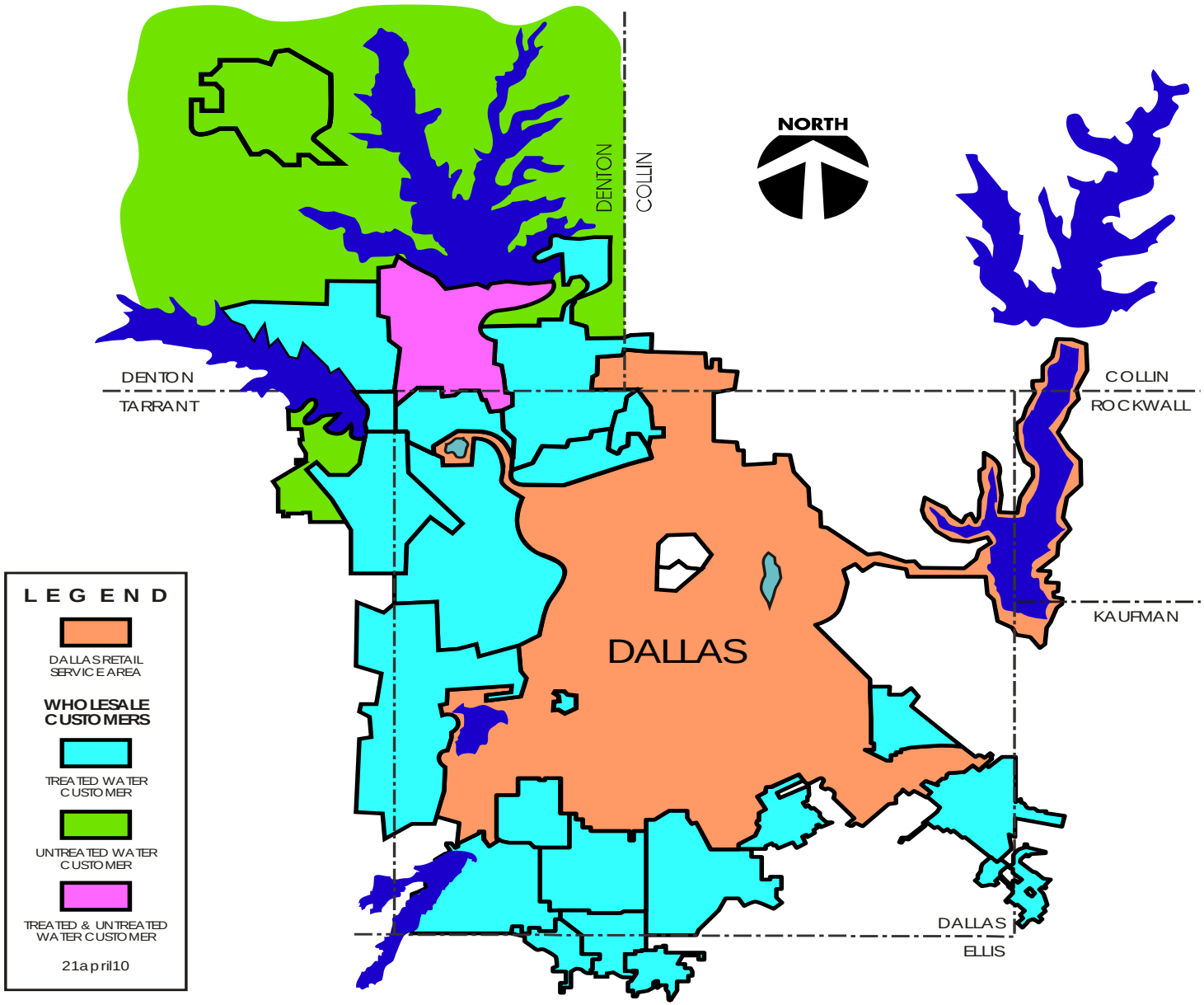
- The water department was founded in 1881
- The water department is funded from water and wastewater revenues, and does not receive tax dollars
- Approximately 1,500 employees
- Population served
  - ~1.2 million - Dallas
  - ~1.2 million in 27 wholesale customer cities
  - ~2.4 million total
- 699 square mile service area
- 300,000+ retail customer accounts
- 4,925 miles of water mains
- 4,018 miles of wastewater mains
- Treated 135 BG of water in FY14 meeting all regulatory guidelines
- Treated 55 BG of wastewater in FY14

How Water is Used in Dallas

Fiscal Years 2009 – 2013



Dallas Water Utilities Service Area



Water Supply Planning

Lewisville Lake and Dam

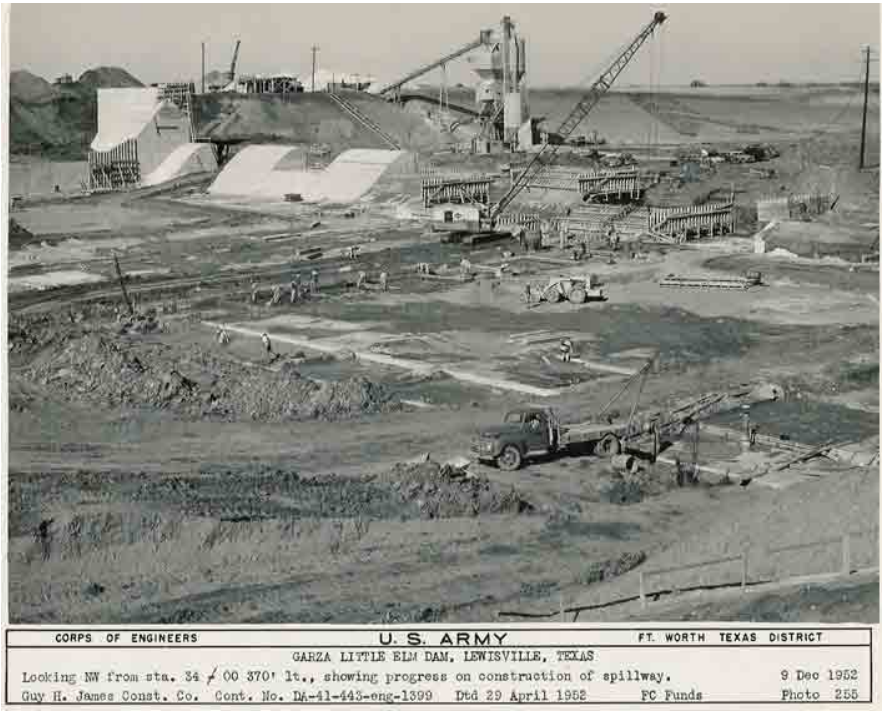
Planning Guidelines

- **Dallas plans to have enough reservoir firm yield to meet water demands equivalent to the 1950s drought of record**
- Dallas' ranking for planned new water supply sources has been based on:
  - Costs – capital construction and power
  - Efficiency
  - Environmental impact
  - Likelihood for development
- Water located closer to the City is generally less expensive
  - Lower infrastructure costs due to shorter pipelines
  - Lower pumping (energy) costs – a recurring, annual expense
- Working with other area water providers to achieve greater economies of scale and thus reduce costs


Lake Ray Hubbard, Muddy Creek Branch 2014

Dallas' Water Supply Planning

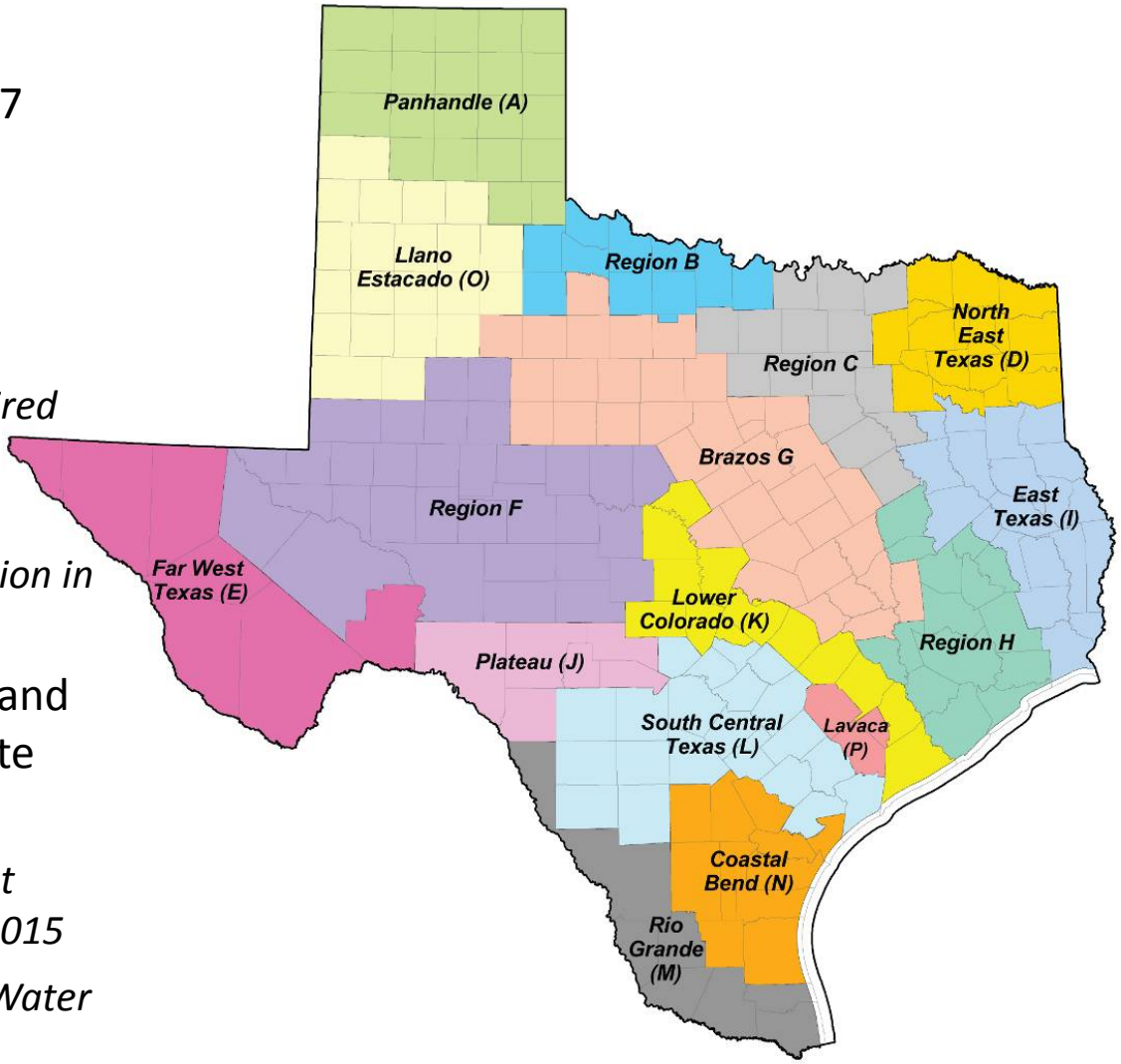
- Dallas' 1959 Long Range Water Supply Plan was updated in 1975, 1989, 2000 and 2005
  - *The 1959 study recommended that Dallas supply water to surrounding cities*
- As a result of the City's planning processes, the following lakes were constructed:
  - Lake Grapevine (1952)
  - Lake Lewisville (1955)
  - Lake Tawakoni (1964)
  - Lake Palestine (1971)
  - Lake Ray Hubbard (1973)
  - Lake Fork (1980)
  - Lake Ray Roberts (1989)



- Later studies encouraged Dallas to develop aggressive water conservation and reuse plans, connect existing reservoirs to Dallas' system and revise Dallas Water Utilities' water supply planning area—actions that have been implemented or are ongoing

Regional Water Planning

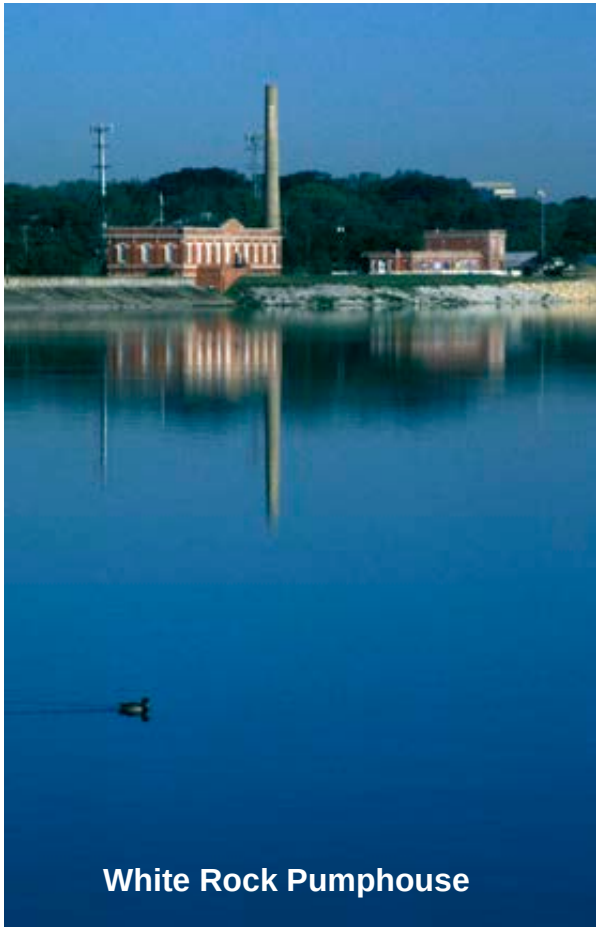
- The passage of Senate Bill 1 in 1997 changed water supply planning throughout the State
  - *Regional water planning groups established*
  - *Regional and State water plans required every five years*
  - *Local plans provided to the Regional Water Planning Group for consideration in the Regional Water Plan*
- State Water Plan due to Governor and Legislature in 2017 to meet the State Water Plan Schedule
  - *Council approved water management strategies due to Region C January 2015*
  - *Region C Water Plan is due to Texas Water Development Board November 2015*



The Long Range Water Supply Plan (LRWSP)

- Since the 2005 Update to the Long Range Water Supply Plan various 2005 planning assumptions have changed
  - The 2010 Census was released, water conservation plan success, the loss of Lake Fastrill reservoir site and Oklahoma water and the adoption of environmental flow standards by the State
- Began work in Fall 2012 to update LRWSP
  - To develop population and water demand projections, evaluate existing supplies, and identify and recommend supply strategies to meet needs through 2070
  - Draft report is currently under review and anticipated to be published in early 2015

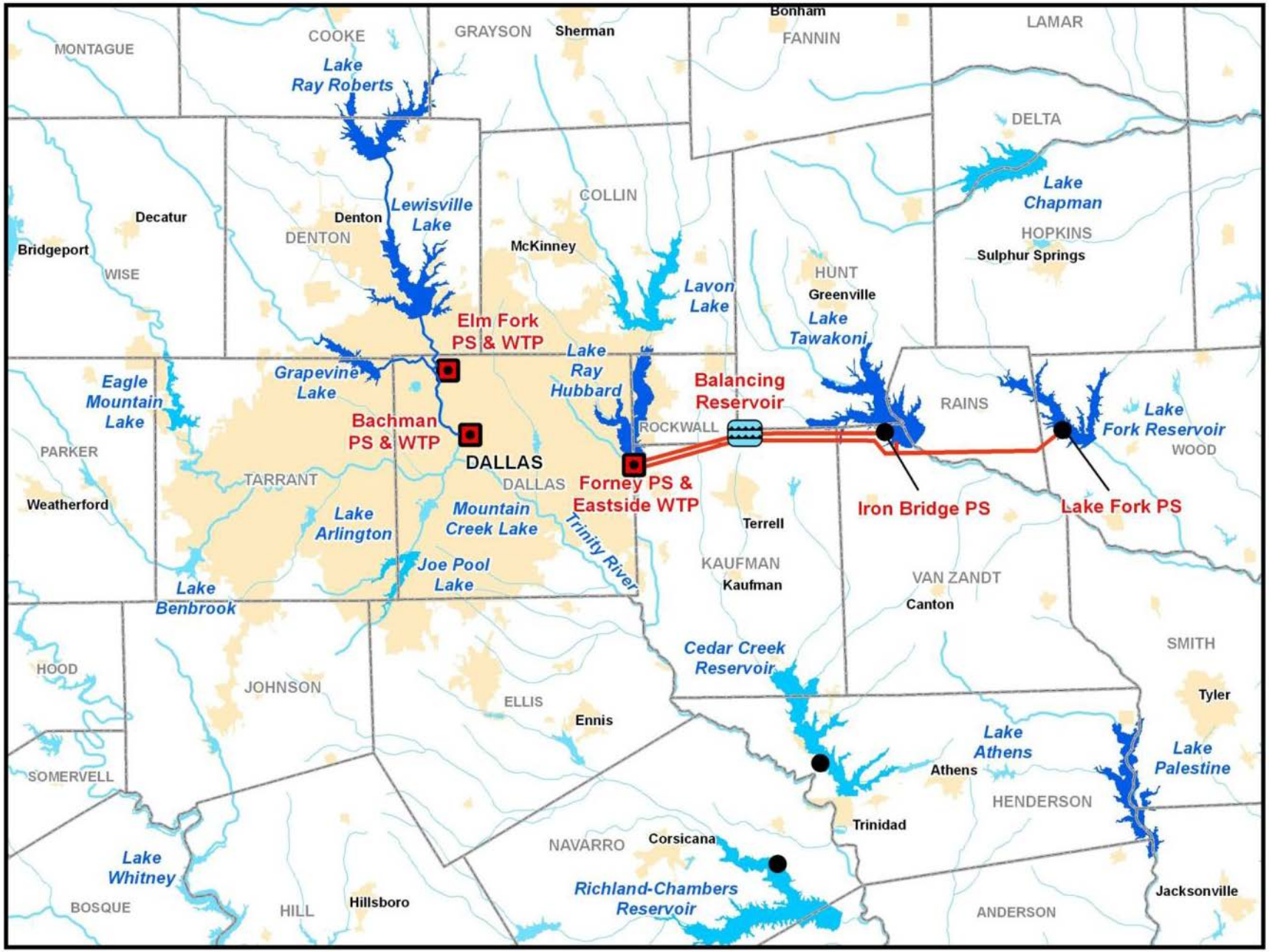
Additional Studies in Support of LRWSP


White Rock Pumphouse

- Sulphur River Basin Wide Study
  - Partnership with Sulphur River Basin Authority and four other regional partners
  - Identified combined water supply needs of partners
  - Recommendations considered in LRWSP multi level screening process
- Upper Neches River Water Supply Project (Fastrill Replacement Project)
  - Run-of-River diversions from the Neches River near the Fastrill dam site with delivery to the Integrated Pipeline (IPL) pump station at Lake Palestine
  - Recommendations considered in LRWSP multi level screening process

Long Range Water Supply Plan Demand, Supply and Needs

Dallas' Regional System Current Water Supply



Water Demand Projections

- Water Demand (gal/day) = Population[1] x GPCD[2]

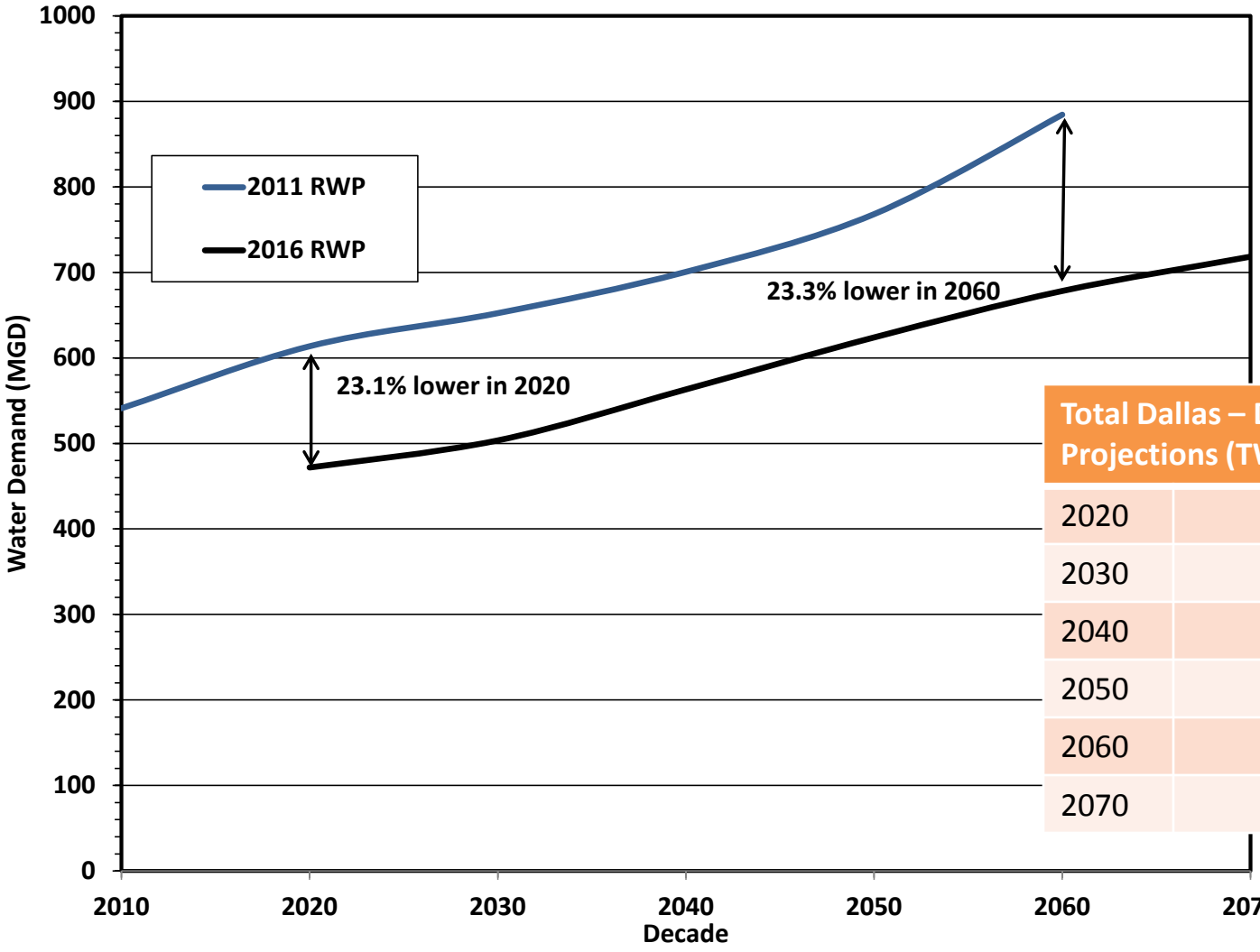
$$\text{Million Gallons Per Day(MGD)} = \frac{\text{Water Demand X 365}}{1{,}000{,}000}$$

[1]Population for Dallas and Customer Cities from TWDB, developed by State Demographer

[2]Gallons per Capita per Day (GPCD) for Dallas and Customer Cities from TWDB

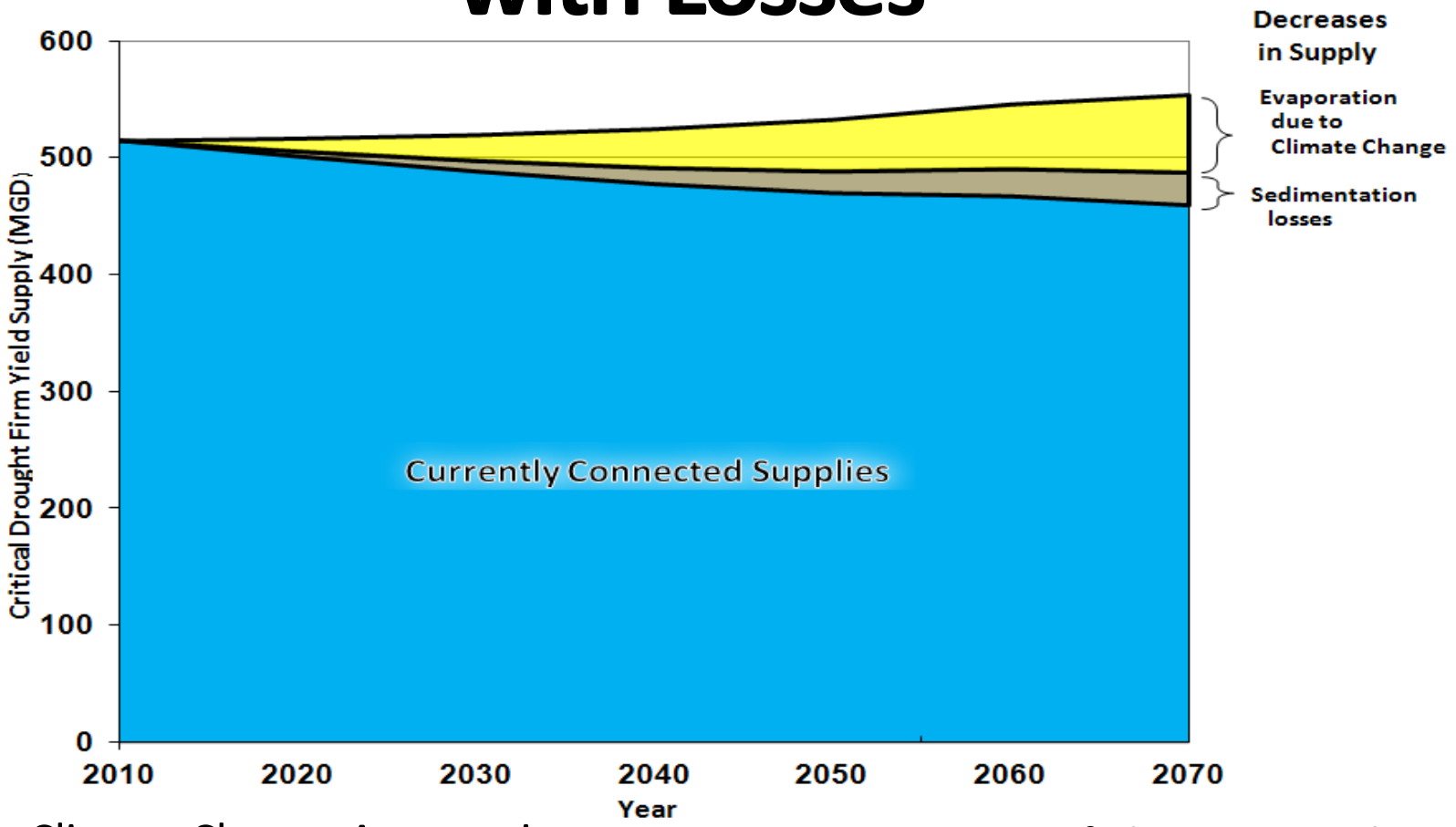
- Population and GPCD coordinated with TWDB for consistency with regional planning
- Previous conservation savings are considered demand reduction through reduced GPCD

DWU System Average Day Water Demand Projections



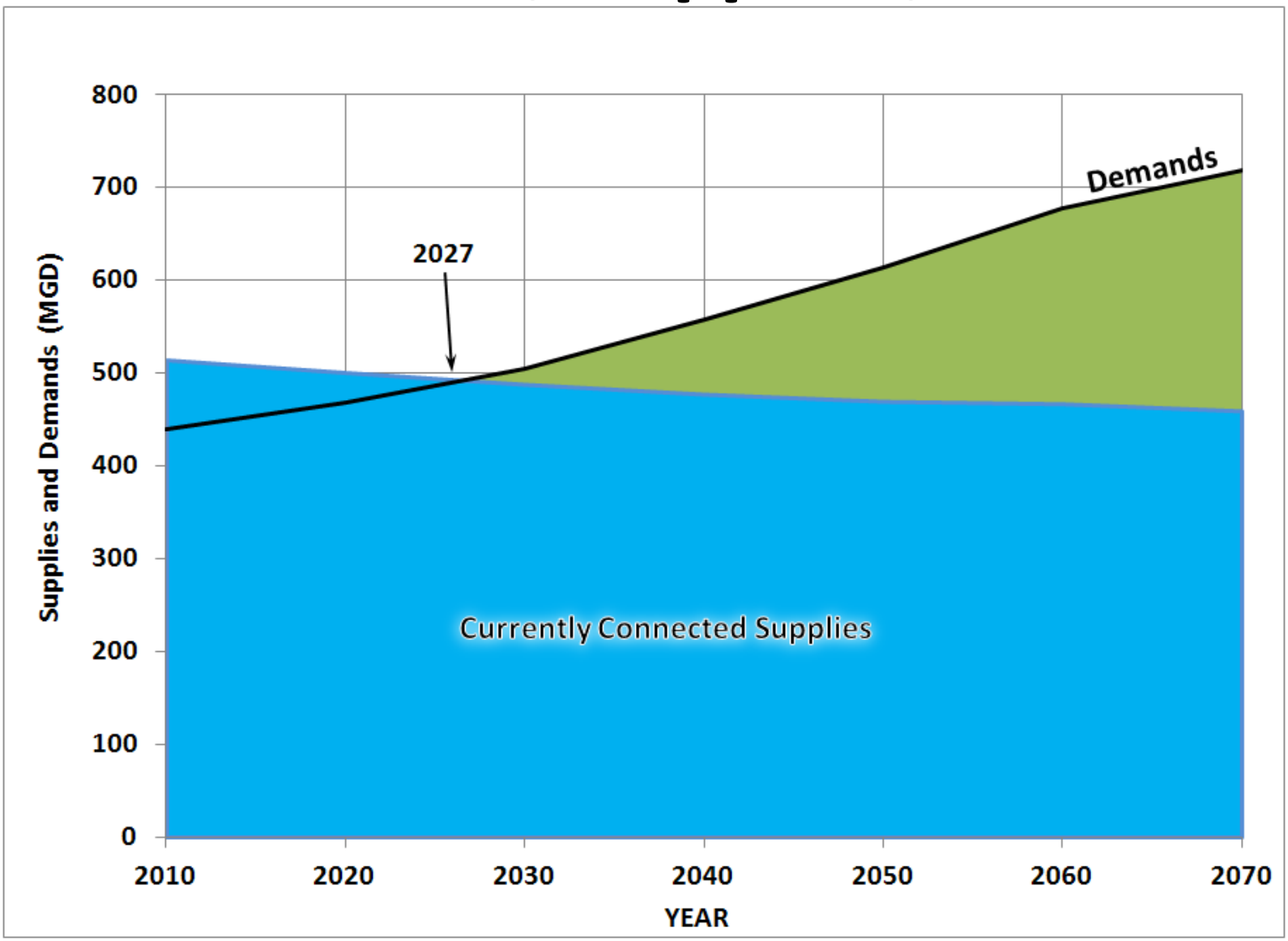
Total Dallas – Demand Projections (TWDB) MGD	
2020	469
2030	504
2040	558
2050	614
2060	678
2070	718

Dallas' Regional Water Supply System with Losses



- Climate Change Assumption - Increase in temperature of 2°F in 2020 and increasing to 7°F in 2070
- Sedimentation Assumption – Combined average 0.093% reduction per year based on historic sedimentation identified in sediment surveys

Demands / Supplies / Needs



Future Water Needs
Dallas' Regional System

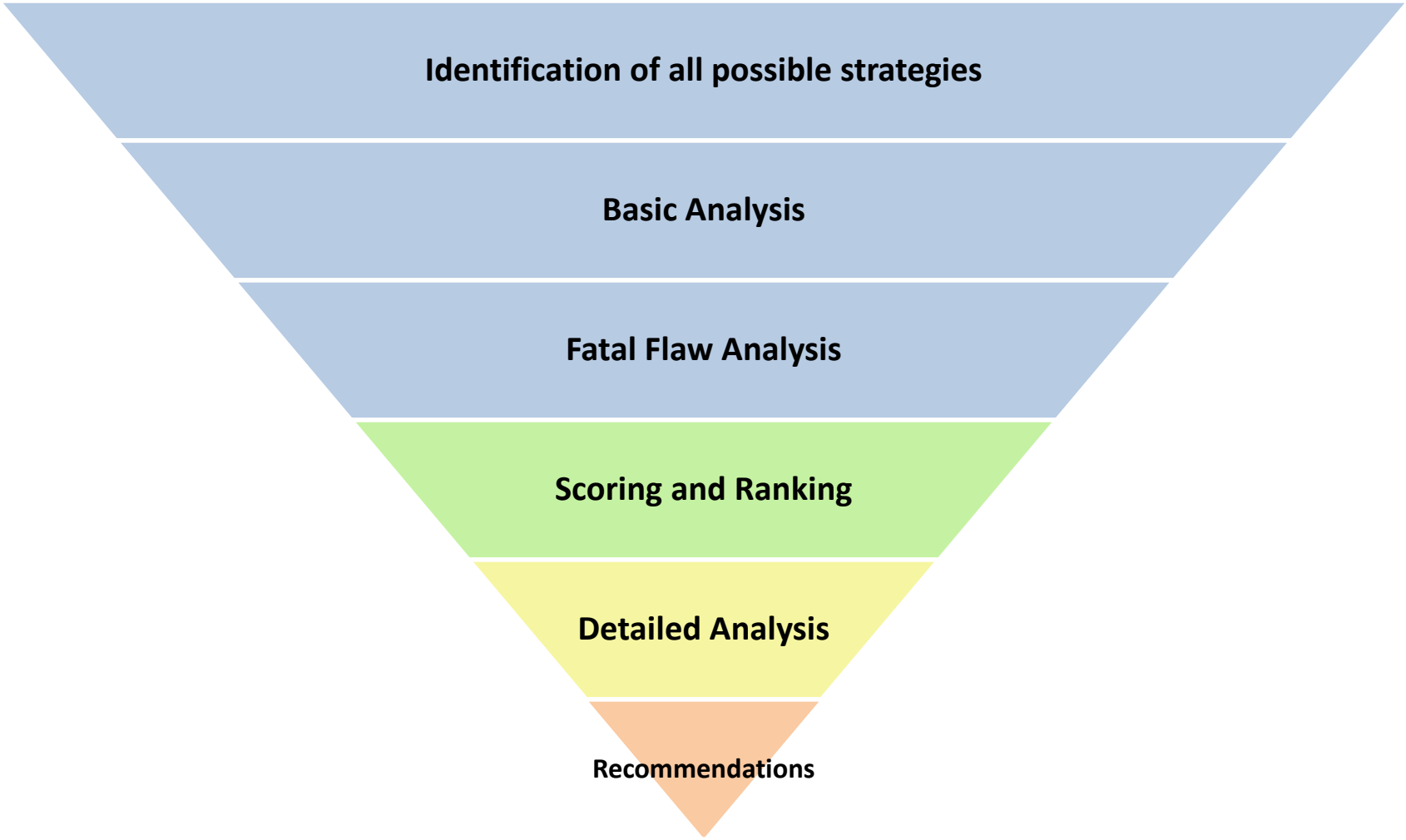
- Buffer Supply – Connected supply in surplus of current demands
  - Drought worse that the drought of record
  - Growth rate greater than projected
  - Emergency Demands
- Water Supply deficit (i.e. loss of reserve) begins in 2027
- By 2070 the DWU Regional System needs an additional 258 MGD

Connected Supply
Buffer Supply and Shortages

Year	Demand (MGD)	Connected Supplies (MGD)	Buffer Supply (Shortage) (MGD)
2010	440	515	75
2020	469	501	32
2030	504	489	(15)
2040	558	478	(80)
2050	614	470	(144)
2060	678	468	(210)
2070	718	460	(258)

LRWSP Water Management Strategy Preferred Options

Water Management Strategy Multi Level Screening Process



Multi Level Screening Process

- **Identification of all possible strategies**
  - 312 strategies identified
  - 3 Classes of strategies
    - Previously studied – updated costs
    - Previously studied- updated with new information
    - New strategies
- **Performed Basic/Fatal Flaw Analysis**
    - Out of Date / Duplicate
    - Not a Dallas Strategy (project identified for another entity)
    - Fatal flaw or potential fatal flaw reducing the likelihood a project could be permitted or constructed (e.g. Lake Fastrill)
- **41 Potentially Feasible Strategies for further consideration and detailed analysis**

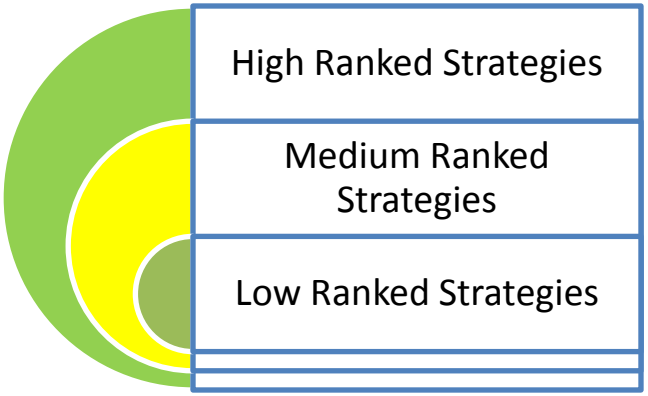
Scoring and Ranking Criteria

Basic Criteria

- Supply Available
- Total Project Cost
- Unit Cost
- Annual O&M Cost

Advanced Criteria

- Environmental Impacts
- Confidence / Permitting / Legal
- Flexibility / Phasing
- Water Quality Concerns



Detailed Analysis

- Supply operations analysis
- East vs. West Supply
- Implementation and phasing analysis
- Advanced cost scrutiny, impacts research and yield analysis
- Evaluation of impacts to existing Dallas infrastructure
- Consideration as a potential regional supply strategy
- Results in Preferred List of 14 strategies

Preferred Strategies

Strategy ID	Water Management Strategy	Projected Supply		Cost		Ranking		
		Acre-feet	MGD	per acre foot	per 1,000 gal	Basic	Advanced	Combined
A	Additional Conservation	52,481	47	$600	$1.84	20	1	1
B-1	Indirect Reuse Implementation - Main Stem Pump Station & Balancing Reservoir	114,337	102	$580	$1.78	10	3	2
B-2	Indirect Reuse Implementation - Main Stem Pump Station - NTMWD Swap Agreement	34,750	31	$239	$0.73	2	10	3
C-1	IPL - Connect to Palestine	114,337	102	$751	$2.30	27	2	4
C-2	IPL - Bachman Connection			$551	$1.69	7	11	5
D-1	Direct Reuse - Alt1	2,609	2	$701	$2.15	11	4	6
E-1	Carrizo Wilcox Groundwater 2	30,000	27	$496	$1.52	1	16	8
F-1	Neches Run-of-River	45,075	40	$636	$1.95	4	12	9
G	Lake Columbia	56,000	50	$560	$1.72	6	28	16
H	Sabine - Conjunctive Use -System Operations (Groundwater and Off Channel Reservoir)	104,200	93	$734	$2.25	21	13	18
J-2	Red River Off Channel Reservoir -1	114,000	102	$734	$2.25	24	8	21
L-1	Wright Patman (232.5) / Marvin Nichols (296.5)	114,000	102	$742	$2.28	28	15	25
O-2	Toledo Bend to West System	200,000	179	$1,023	$3.14	38	36	39
Q	Lake Texoma Desalination	146,000	130	$1,186	$3.64	36	38	37

Demand, Supply and Recommended Strategies

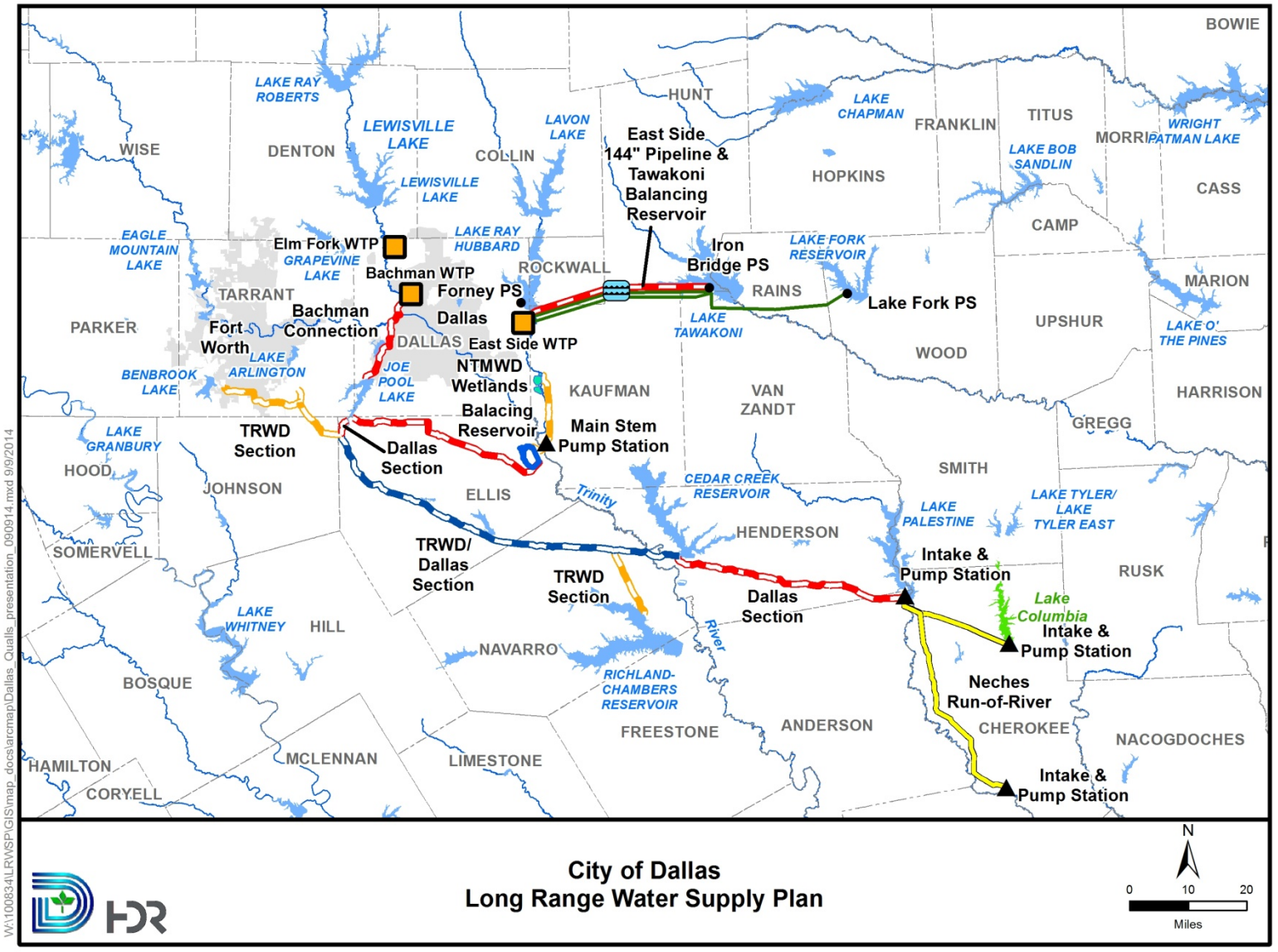
Strategy ID	Planned Supplies (MGD)	2020	2030	2040	2050	2060	2070
	Projected Demands	**469**	**504**	**558**	**614**	**678**	**718**
	Total Available Water Supplies	**501**	**489**	**478**	**470**	**468**	**460**
	Current Supply Buffer (Shortage)	**32**	**(15)**	**(80)**	**(144)**	**(210)**	**(258)**
	Water Management Strategies						
A	Additional Conservation	11	25	37	43	45	47
	Indirect Reuse Implementation						
B-2	Main Stem Pump Station -NTMWD Swap Agreement	31	31	31	31	31	31
B-1	Main Stem Balancing Reservoir				75	91	102
	Connect Lake Palestine						
C-1	IPL Connection to Palestine		102	102	102	102	102
C-2	IPL Connection to Bachman						
F-1	Neches Run-of-River					40	40
G	Lake Columbia						50
	Total Supplies from Strategies	**42**	**158**	**170**	**251**	**309**	**372**
	Total Supplies	**543**	**647**	**648**	**721**	**777**	**832**
	Supply Buffer	**74**	**143**	**90**	**107**	**99**	**114**

Alternate Strategies

Strategy ID	Planned Supplies (MGD)	2020	2030	2040	2050	2060	2070
D-1	Direct Reuse Alternative 1					2	2
E-1	Carrizo Wilcox Groundwater 2					27	27
H	Sabine Conjunctive SysOp (Off Channel Reservoir and Groundwater)					93	93
J-2	Red River Off Channel Reservoir -1					102	102
L-1	Wright Patman (232.5) / Marvin Nichols (296.5)					102	102
O-2	Toledo Bend to West System					179	179
Q	Lake Texoma Desalinization					130	130

Note: Strategy E-1 and H are mutually exclusive (i.e. the Carrizo Wilcox groundwater in Strategy E-1 is the same groundwater in Strategy H).

Recommended Strategies 2020 - 2070



Summary

- System average day water demands reduced by 23% or on average approximately 151 MGD
- Connected firm yield reduced over time due to sedimentation and increased evaporation from higher temperatures
- Projected supply and demand deficit beginning in 2027
  - 15 MGD deficit in 2030
  - 258 MGD deficit by 2070
- Recommended strategies identified to address deficit:
  - Additional conservation
  - Indirect Reuse Implementation
    - Main Stem Pump Station (NTMWD Swap Agreement)
    - Main Stem Balancing Reservoir
  - Lake Palestine (Integrated Pipeline Project)
  - Neches Run-of-River
  - Lake Columbia
- October 8 2014 Dallas City Council approved recommended strategies to submit to Region C by January 2015


Questions?