

Memorandum



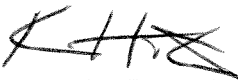
Date: September 12, 2014

To: Honorable Mayor and Members of the City Council

Subject: Long Range Water Supply Plan Briefing – Water Utilities Department

Attached is a briefing that will be presented to the City Council on Wednesday, September 17, 2014. The briefing will provide an update on the current water supply status, a progress update on the Long Range Water Supply Plan and recommended water management strategies to be included in the 2017 State Water Plan.

Please let me know if you should need additional information.



For Mark McDaniel
Assistant City Manager

[Attachment]

Cc: A.C. Gonzalez, City Manager
Warren M. S. Ernst, City Attorney
Craig D. Kinton, City Auditor
Rosa A. Rios, City Secretary
Daniel F. Solis, Administrative Judge
Ryan S. Evans, First Assistant City Manager
Jill A. Jordan, Assistant City Manager
Forest E. Turner, Assistant City Manager
Joey Zapata, Assistant City Manager
Charles M. Cato, (I) Assistant City Manager
Theresa O'Donnell, (I) Assistant City Manager
Jeanne Chipperfield, Chief Financial Officer
Sana Syed, Public Information Officer
Elsa Cantu, Assistant to the City Manager – Mayor & Council
Jo M. (Jody) Puckett, P.E., Director

Long Range Water Supply Plan



Forney Dam at Lake Ray Hubbard

**Dallas City Council
September 17, 2014**





Purpose

- To provide an update on the Current Water Supply Status
- To provide a progress update on the Long Range Water Supply Plan including
 - Updated water demand projections
 - Potential water management strategies

Outline

- Current Water Supply Status and Drought Outlook
- Long Range Water Supply Planning
 - Projected Demands
 - Current Supplies
 - Projected Needs
 - Management Strategies
- Appendix



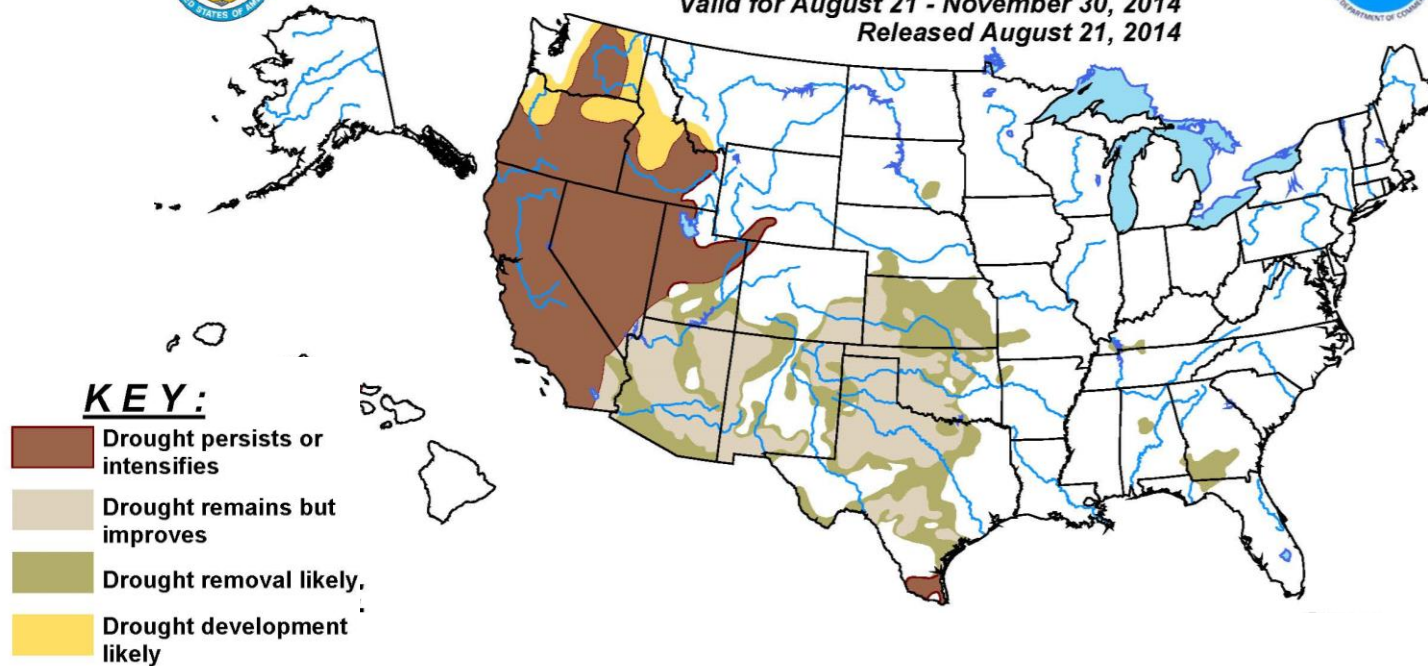
Current Water Supply Status and Outlook



U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

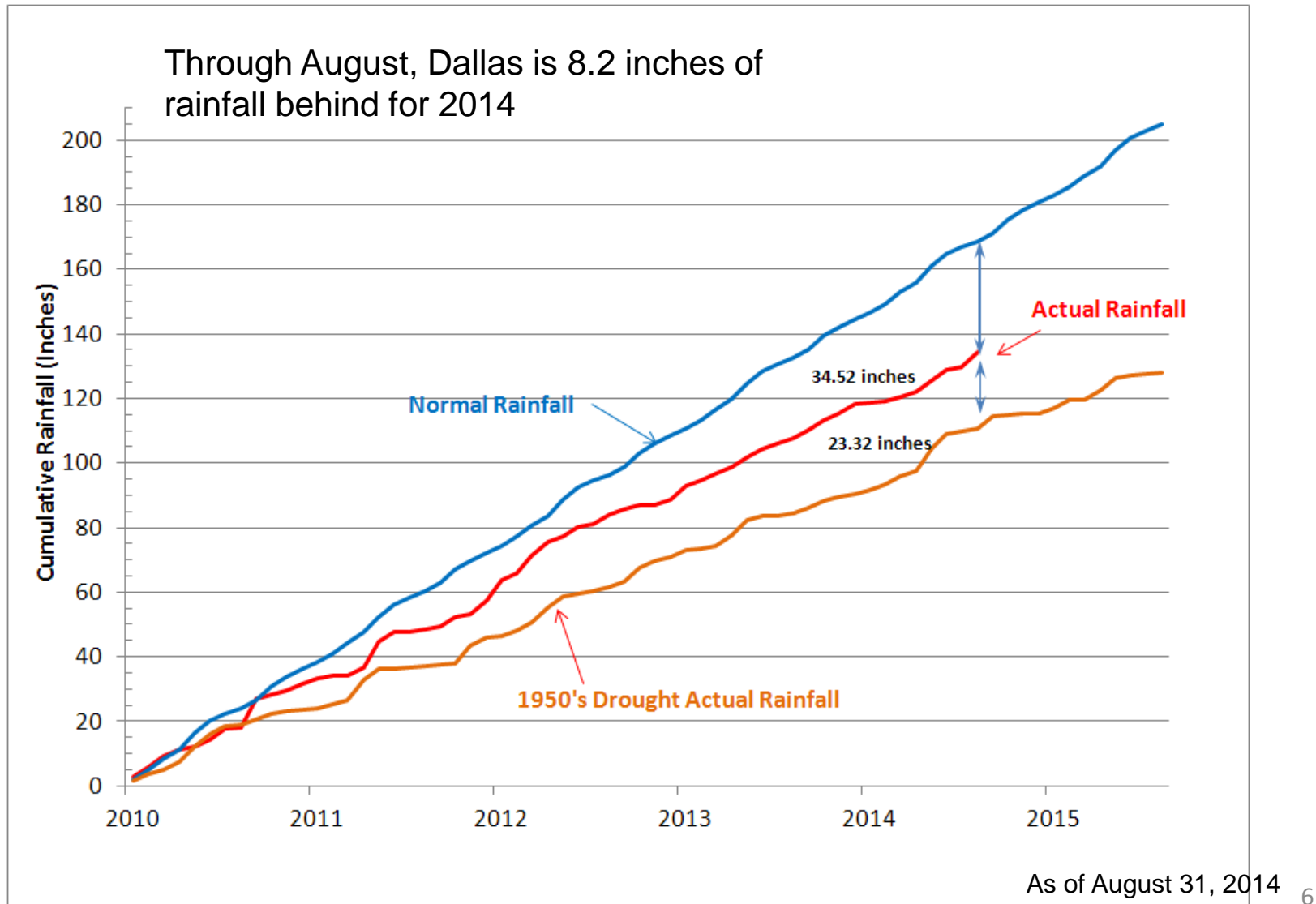
Valid for August 21 - November 30, 2014
Released August 21, 2014



- June and August rainfall continued to improve drought conditions across Texas
- Short term forecasts and enhanced probabilities for above-median precipitation through October, increase the potential for drought improvement or removal across far north Texas
- National Weather Service (NWS) indicates a 65% chance of El Nino emerging in fall and early winter. Forecasters favor a weak event.
 - El Nino for Texas would mean a higher probability of rainfall in the winter and spring, although it is not guaranteed
- The NWS Climate Prediction Center predicts normal temperatures and above normal precipitation through December

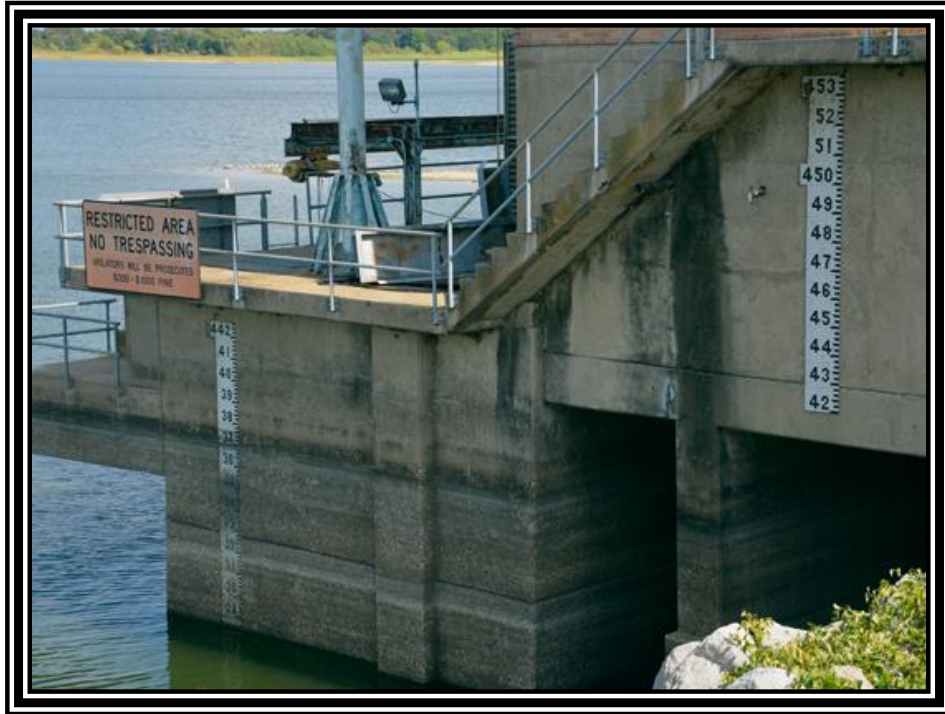
Current Drought Conditions

Dallas' Cumulative Precipitation



Current Lake Conditions

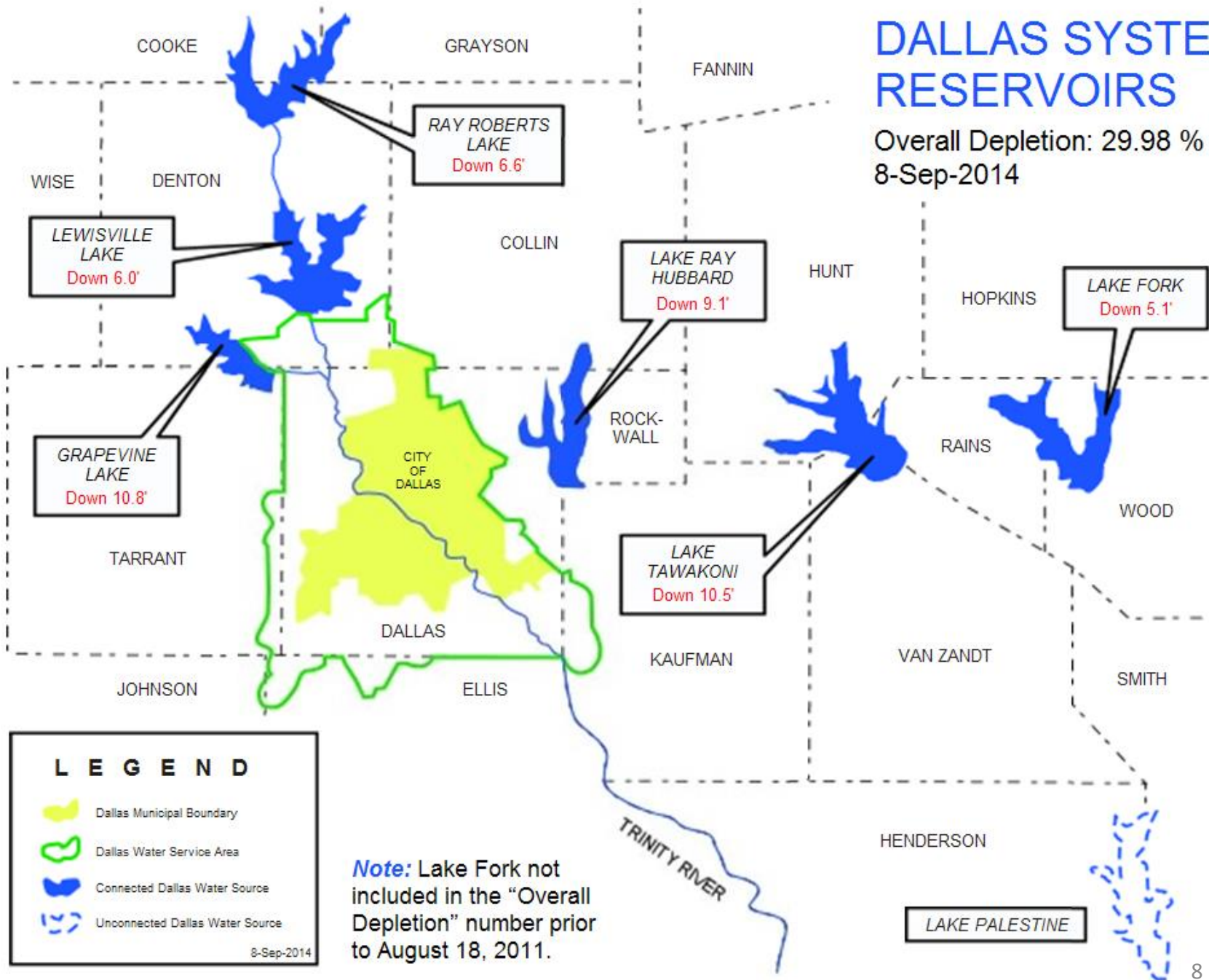
- Current hydrologic drought began 2010
 - Lakes haven't been full since May 2010
 - 2011 worst one-year drought on record
- Dallas' water supplies are currently 30% depleted (8-Sep-2014)
 - One month ago 27.2% depleted
 - One year ago 27.7% depleted



Lake Tawakoni 2013

DALLAS SYSTEM RESERVOIRS

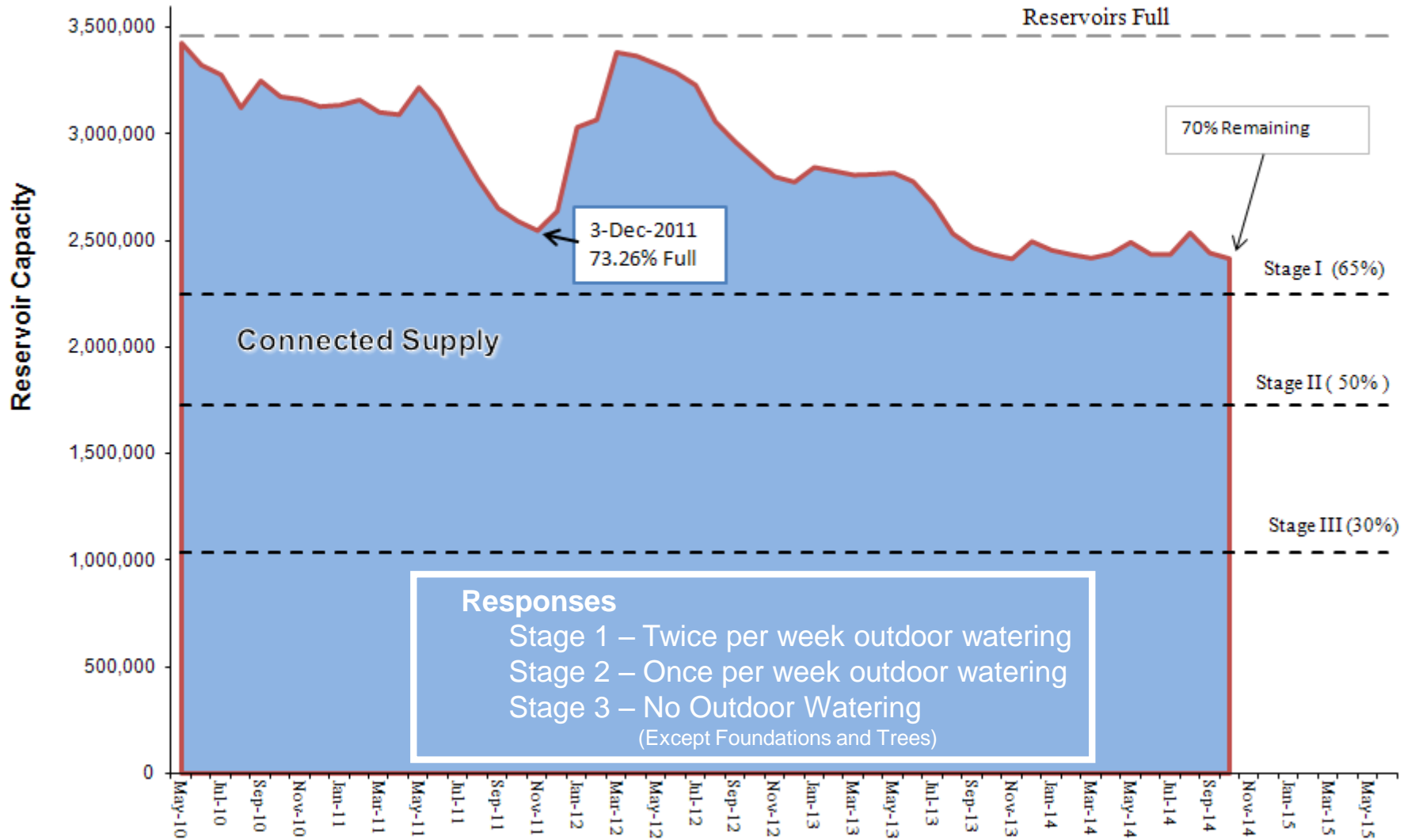
Overall Depletion: 29.98 %
8-Sep-2014



Total Reservoir System Condition Analysis

(Lakes Ray Roberts, Lewisville, Grapevine, Ray Hubbard, Tawakoni and Fork)

As of September 8, 2014

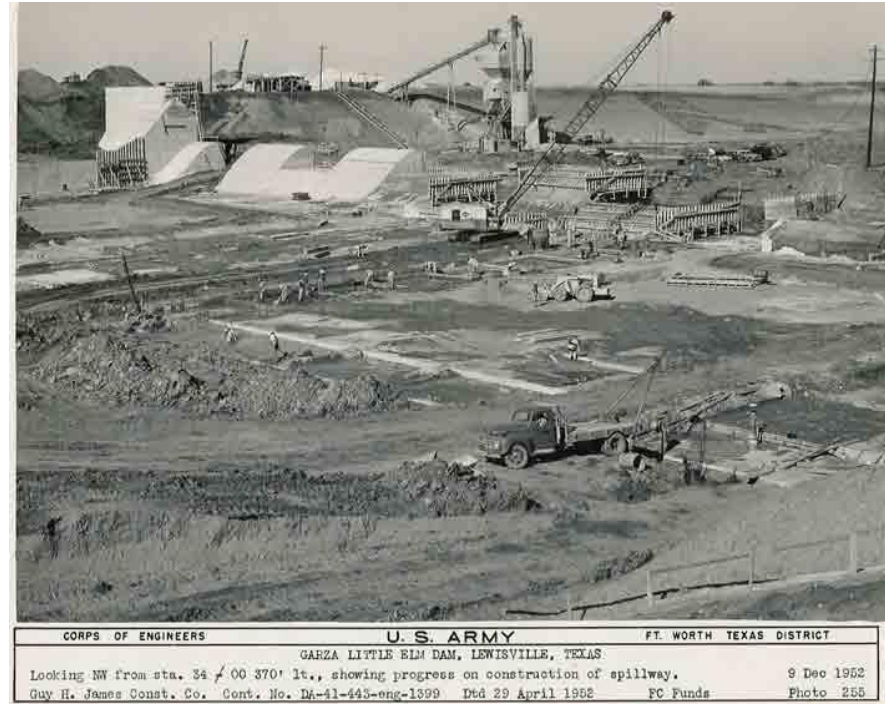




Long Range Water Supply Planning

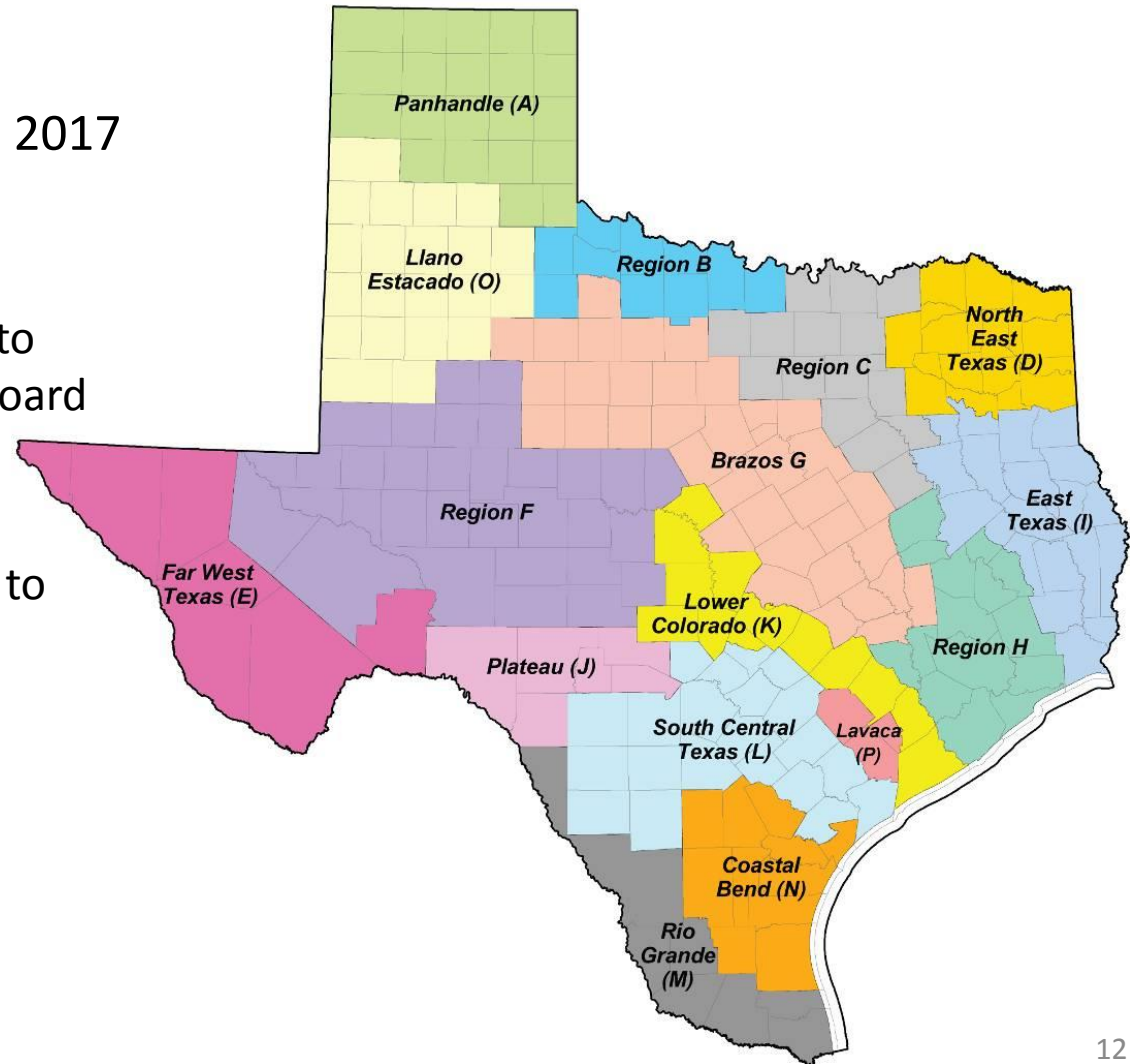
Long Range Water Supply Planning

- 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*
- The passage of Senate Bill 1 of the 75th Legislative Session 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 to be provided to the Regional Water Planning Group for consideration in the Regional Water Plan*



Regional Water Planning

- State Water Plan due to Governor and Legislature in 2017 to meet the State Water Plan Schedule
 - Region C Water Plan is due to Texas Water Development Board (TWDB) in November 2015
 - Council approved water management strategies due to Region C by January 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

Additional Studies in Support of LRWSP



- 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

Water Demand Projections

- Water Demand (gal/day) = Population¹ x GPCD²

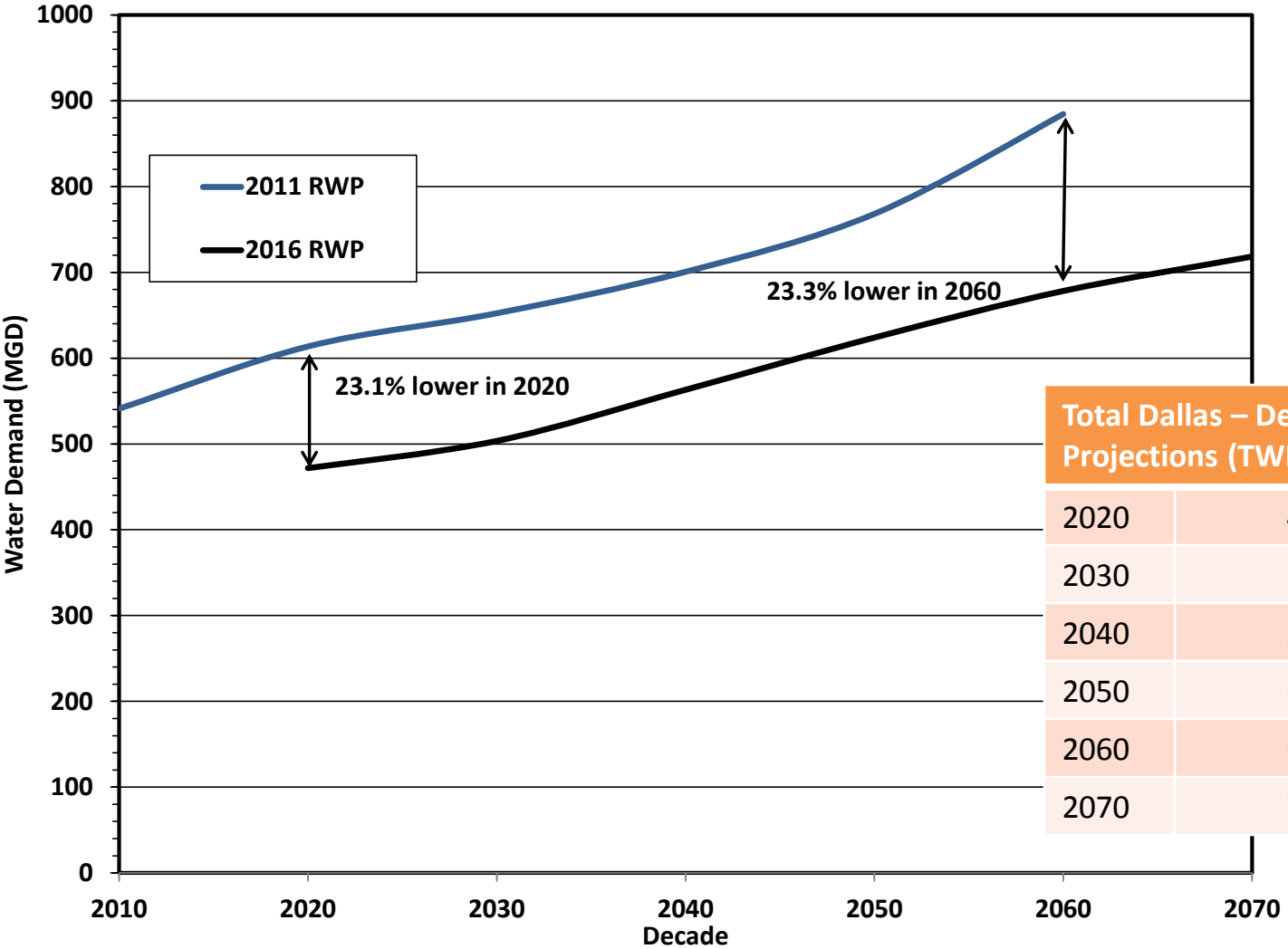
$$\text{Million Gallons Per Day(MGD)} = \frac{\text{Water Demand X 365}}{1,000,000}$$

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

²Gallons 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

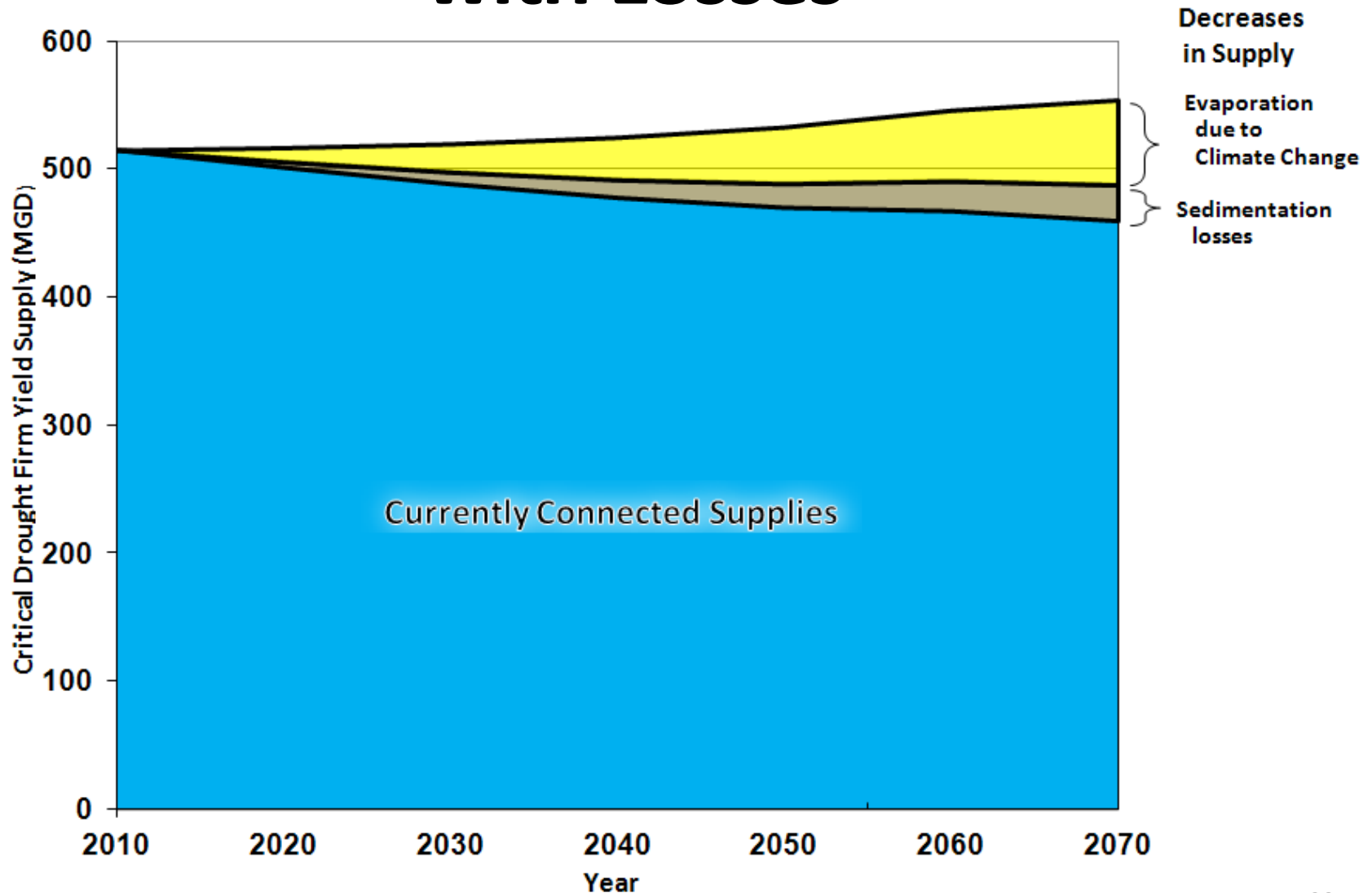
Dallas' Regional Water Supply System

Summary of Dallas' Reservoir Supply Losses from Sediment and Additional Evaporation (MGD)

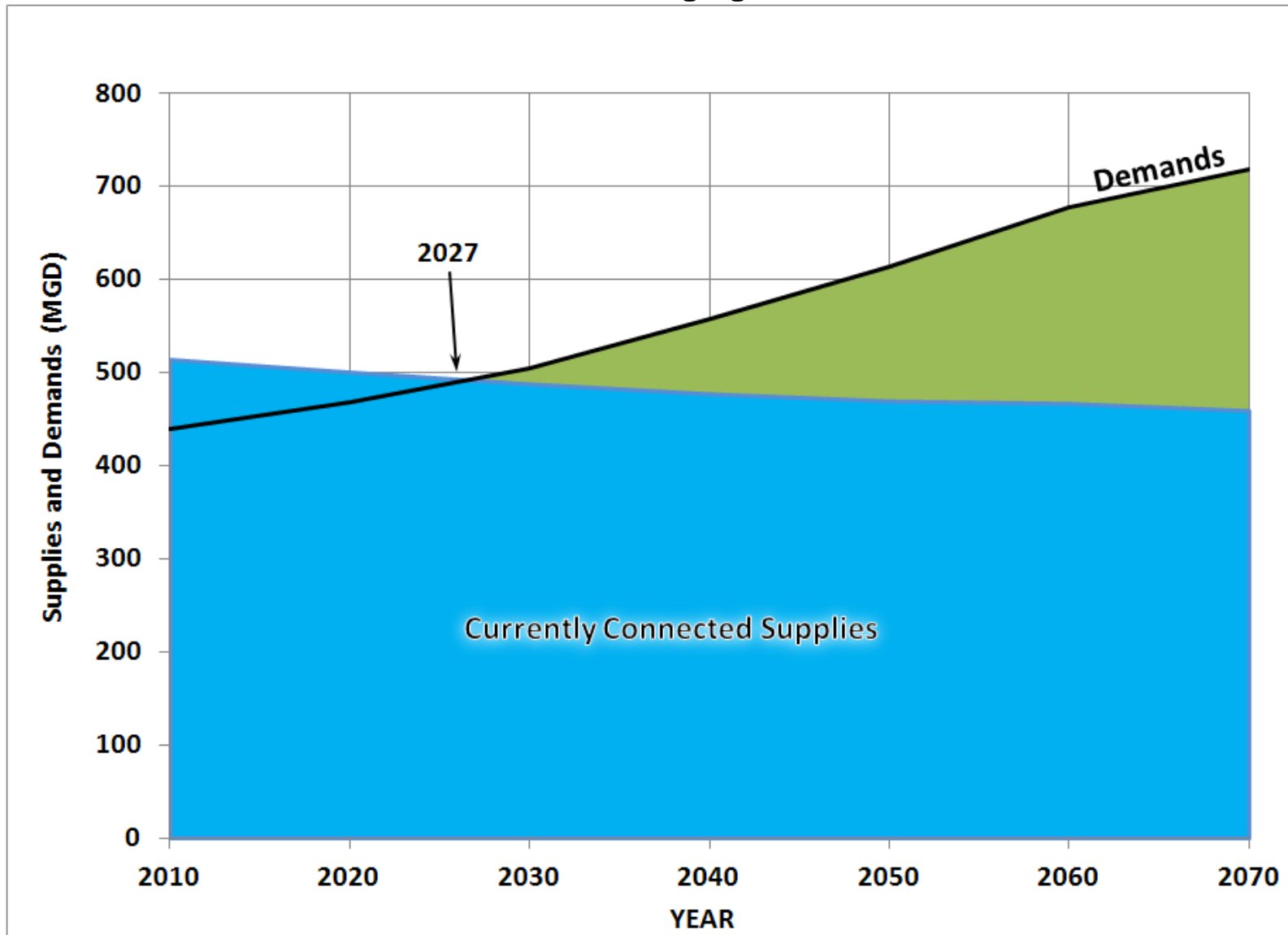
Reservoir	2010 Connected Supply ¹	Sediment Losses Through 2070	Additional Evaporation Losses Through 2070	2070 Connected Supply ²
Lake Grapevine	14	1	3	10
Elm Fork System Lake Ray Roberts Lake Lewisville Elm Fork Run-of-River	167	13	24	130
Lake Ray Hubbard	51	2	4	45
Lake Fork	111	5	16	90
Lake Tawakoni	161	7	19	135
Elm Fork Reuse ³	11	--	--	50
TOTAL	515	28	66	460
¹ 1950's drought supply assuming historical evaporation and current sediment conditions				
² 1950's drought supply assuming +7 degree increase from historical evaporation and 2070 sediment conditions				
³ Reuse Permit authorization; however, may require additional cost for long term reliability				

- 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

Dallas' Regional Water Supply System with Losses



Demands / Supplies / Needs



Future Water Needs

Dallas' Regional System

- Buffer Supply – Connected supply in surplus of current demands
 - Drought worse than 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

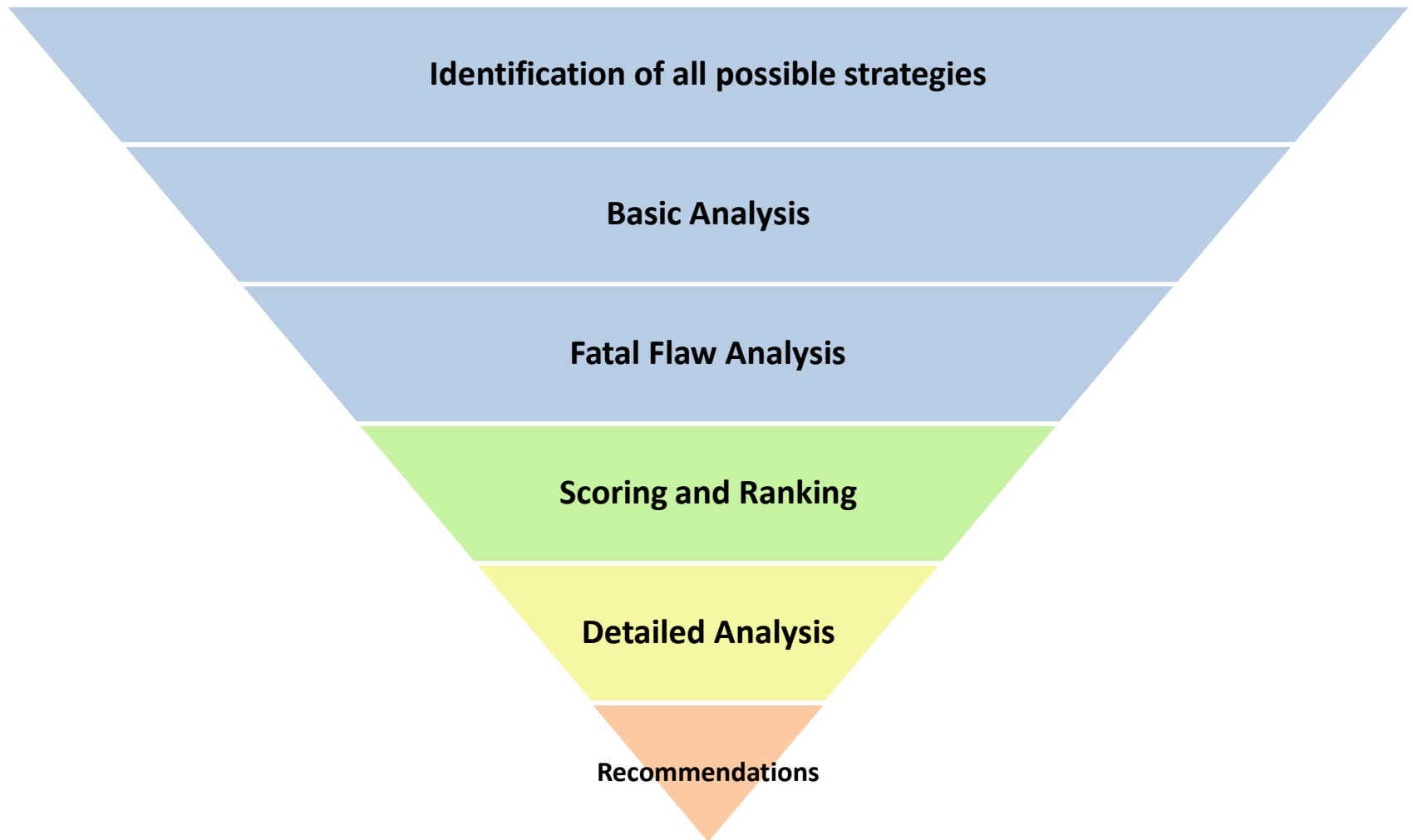
**Connected Supply
Buffer Supply and Shortages**

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**

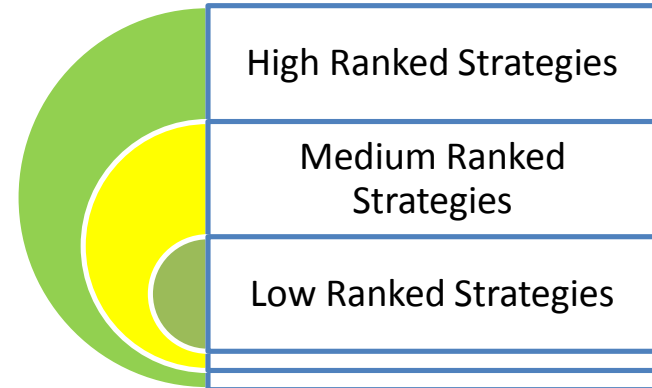
Scoring and Ranking Criteria

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

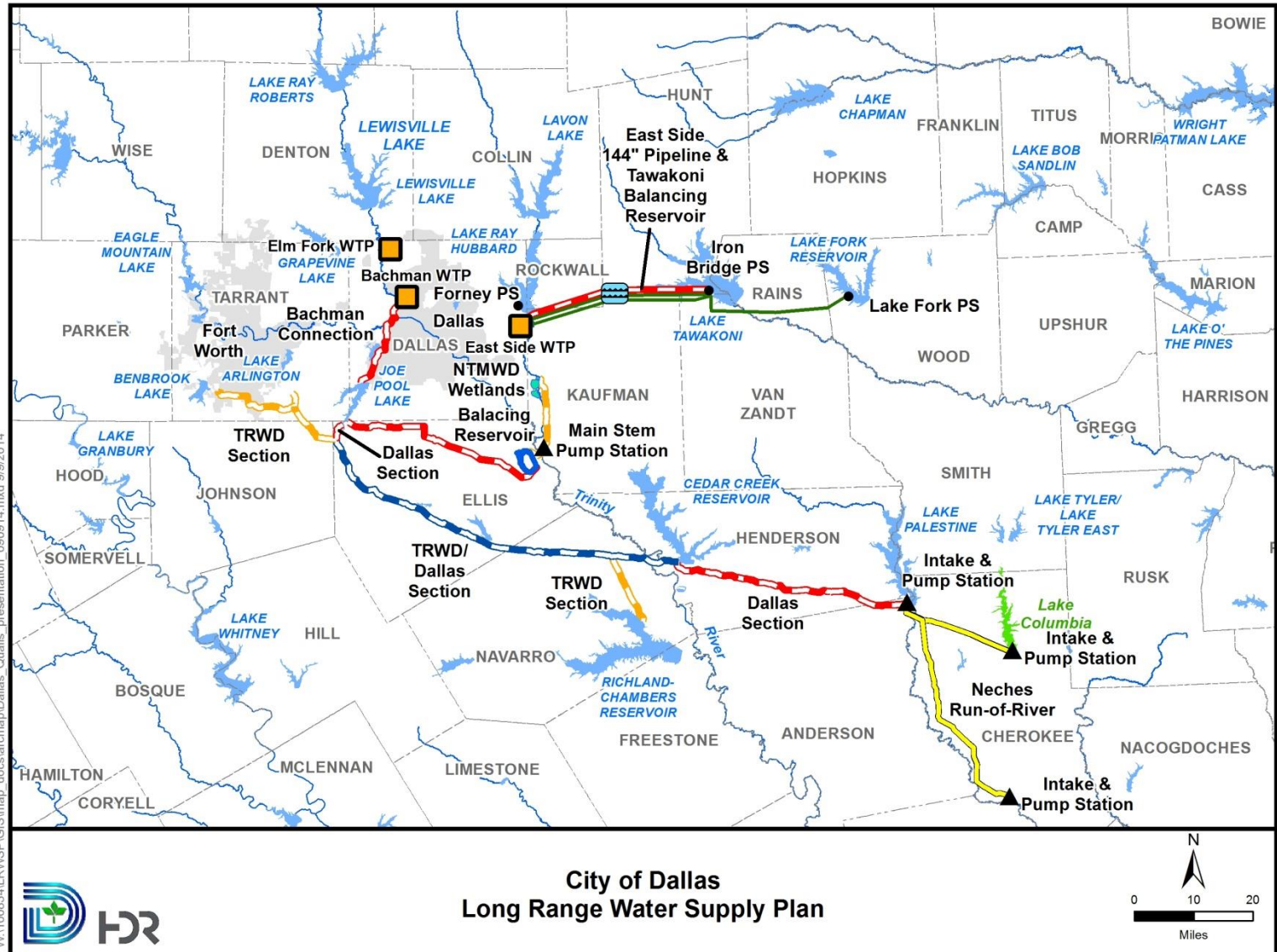
Strategy ID	Planned Supplies (MGD)	2020	2030	2040	2050	2060	2070
	Projected Demands	469	504	558	614	678	718
	Total Available Water Supplies	501	489	478	470	468	460
	Current Supply Buffer (Shortage)	32	(15)	(80)	(144)	(210)	(258)
	Water Management Strategies						
A	Additional Conservation	11	25	37	43	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



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City of Dallas
Long Range Water Supply Plan

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



Next Steps

- Scheduled to seek Council approval on October 8, 2014 of recommended water management strategies to submit to Region C Water Plan

Questions?

Appendix

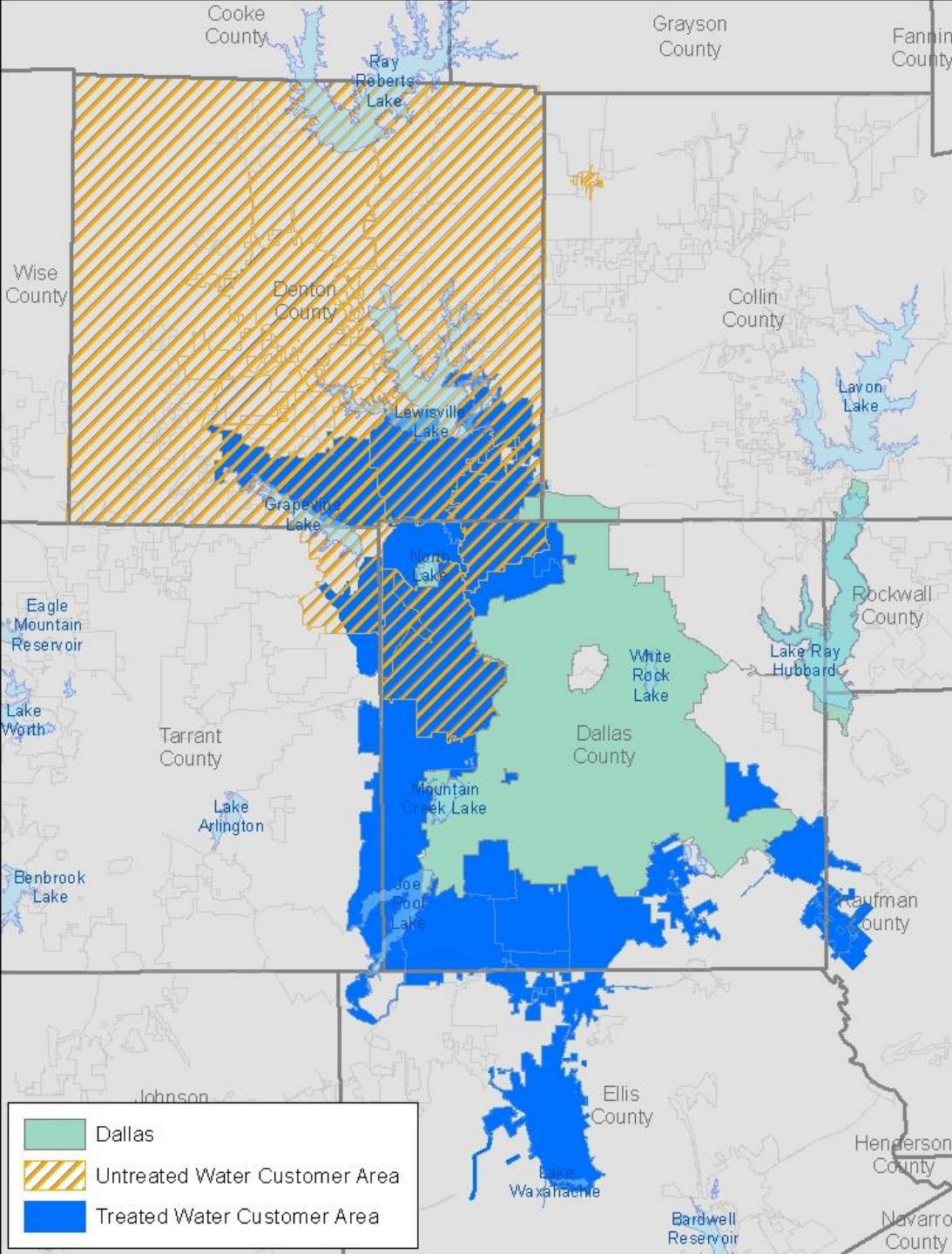
- 2014 Long Range Water Supply Plan Data
- 2005 LRWSP Approved Water Management Strategies

2014 LONG RANGE WATER SUPPLY PLAN DATA

Dallas Water Utilities Service Area

Population served: 2.4 million

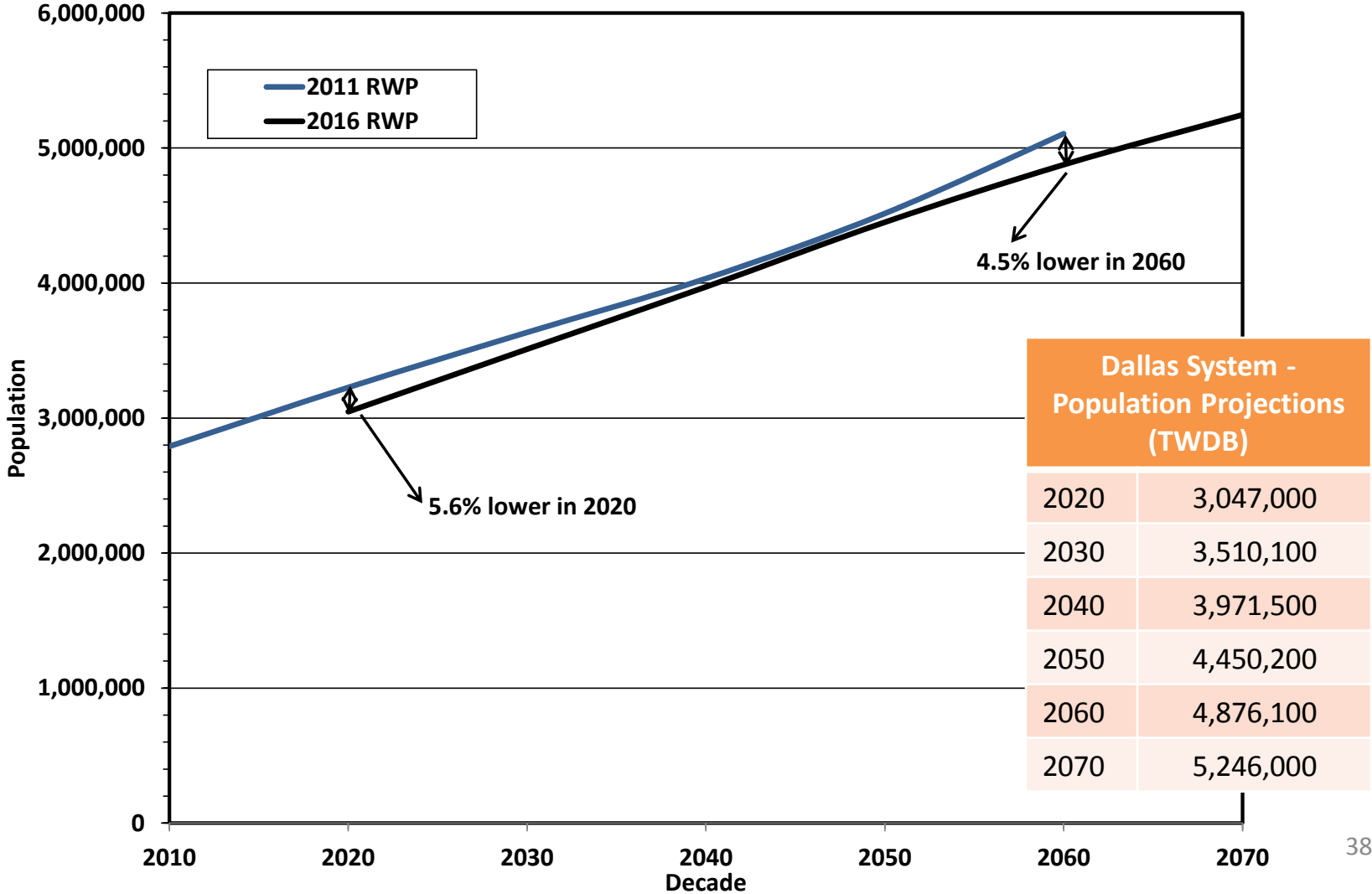
- 1.2 million in Dallas
- 1.2 million in 27 wholesale customer cities



Population Projections

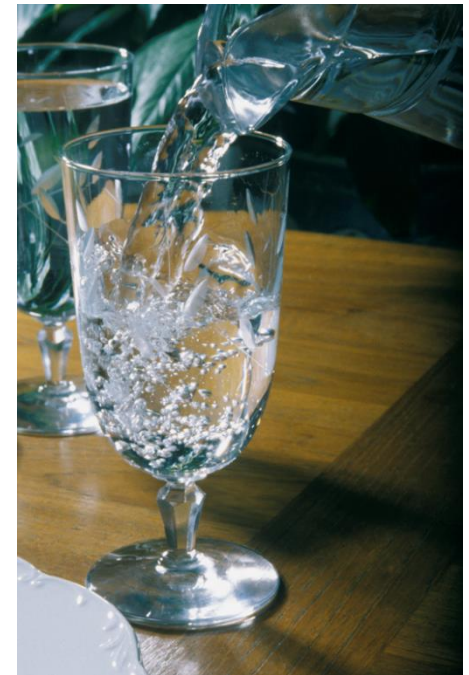
- The foundation of water planning
- Sources of information
 - Texas Water Development Board
 - North Central Texas Council of Governments
 - Independent studies
 - U. S. Census
- Population data is studied for service area including City of Dallas, customer cities and growth areas
- Population curves for projected years are developed by adjusting previous projections against actual data

Population Projections – DWU System



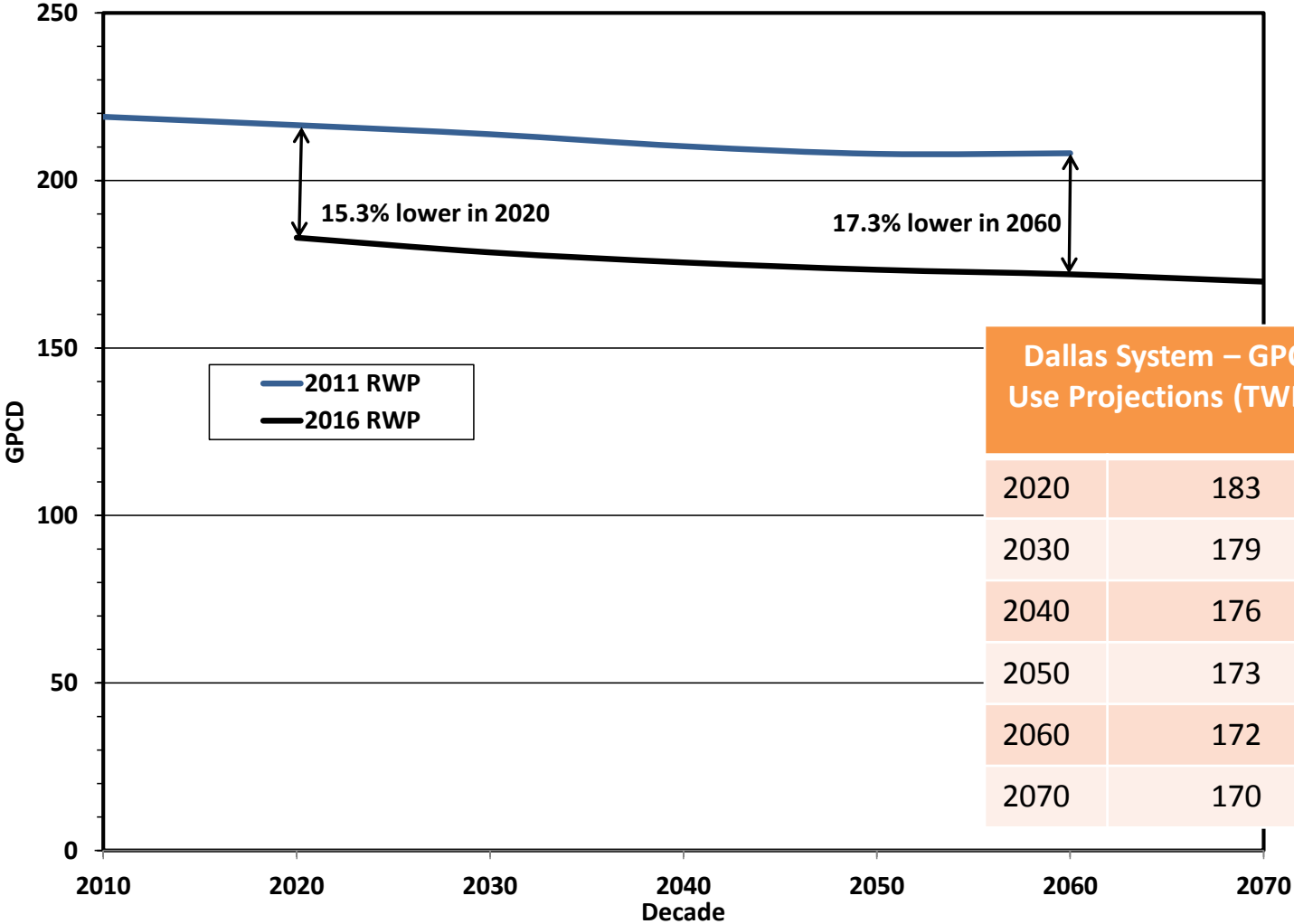
Per Capita Demand Projections

- Water needed by a user on a per-person basis (expressed in gallons per capita per day or GPCD)
- Demands include all types of water use such as residential, commercial, industrial and other for the City of Dallas, customer cities and potential customer cities
- Data analyzed to project average day demands:
 - Historical water demands for the City of Dallas and current customer cities and growth areas
 - Climatic conditions
 - Population density and land use
 - Relative density of commercial businesses
 - Effectiveness of conservation programs

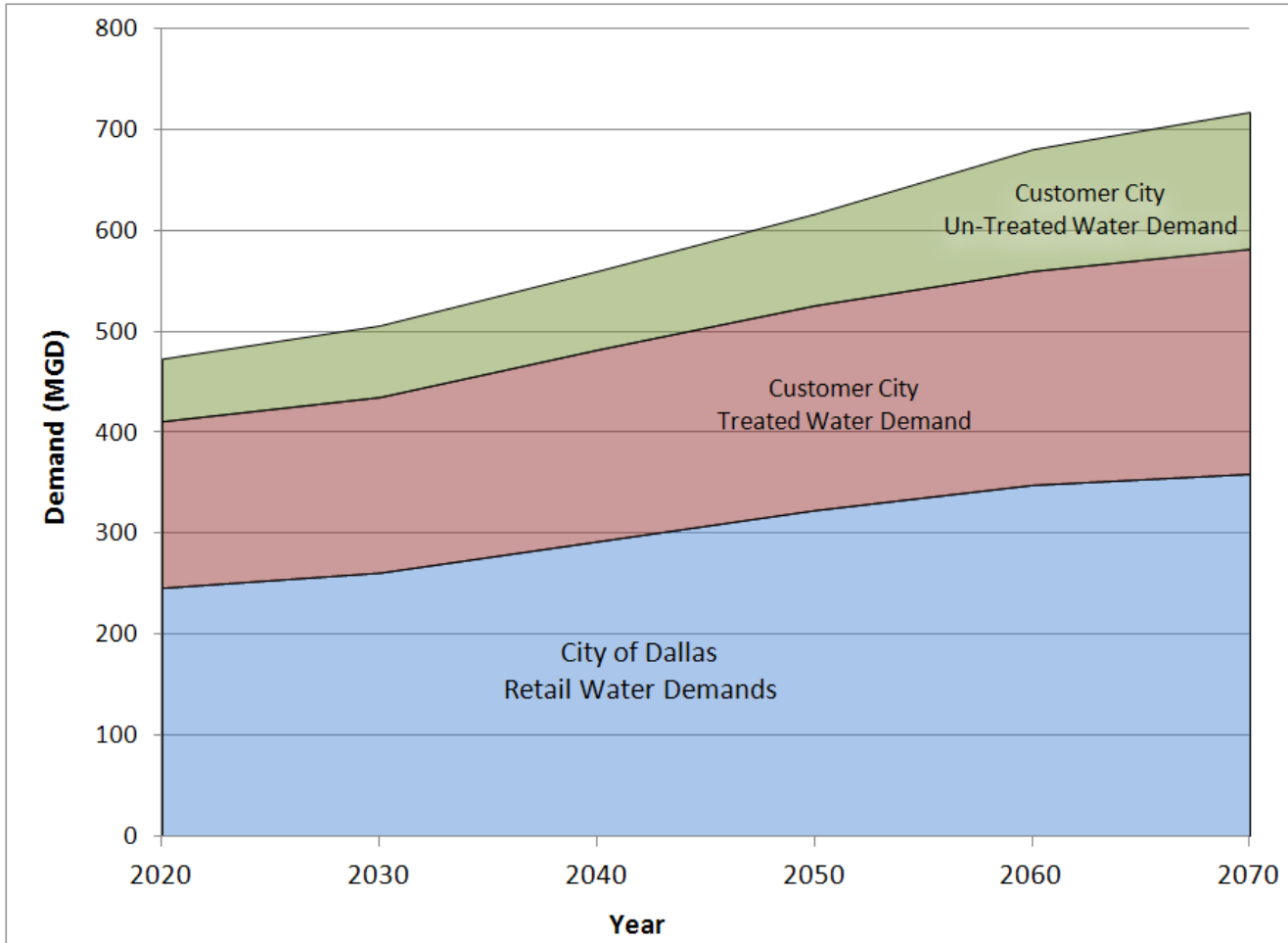


CAUTION: Per Capita Demand Comparisons can only be made on the same system from year to year not system to system

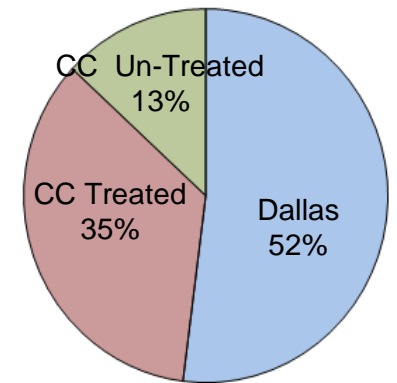
DWU System Per Capita Use (TWDB - Baseline)



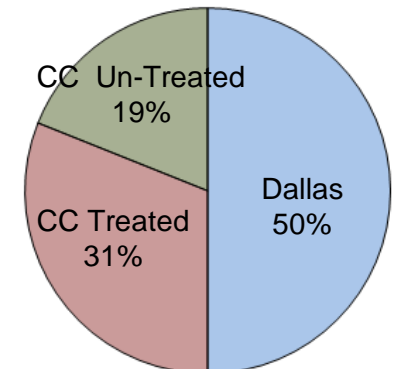
Demand Breakout



2020

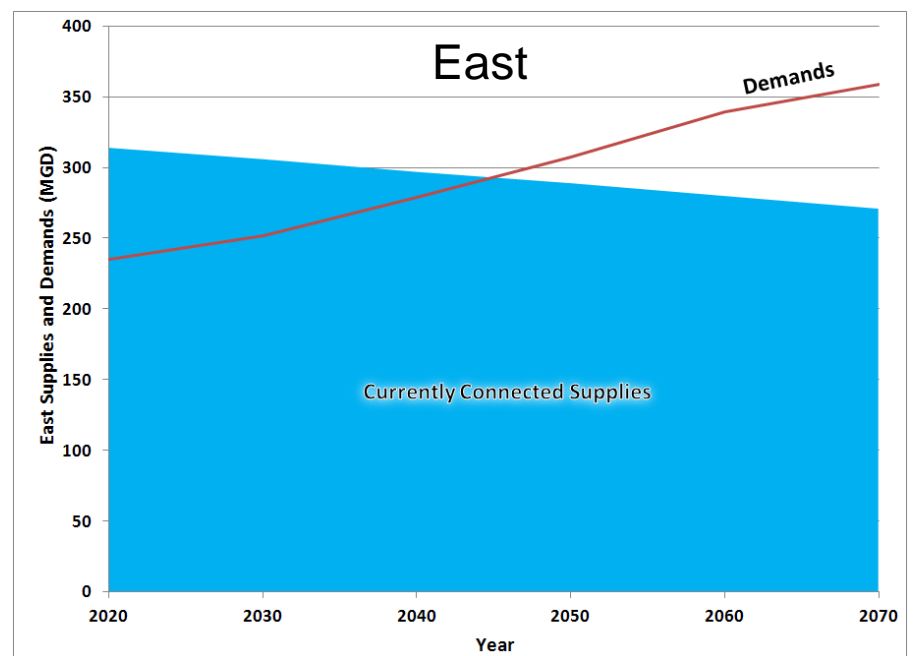
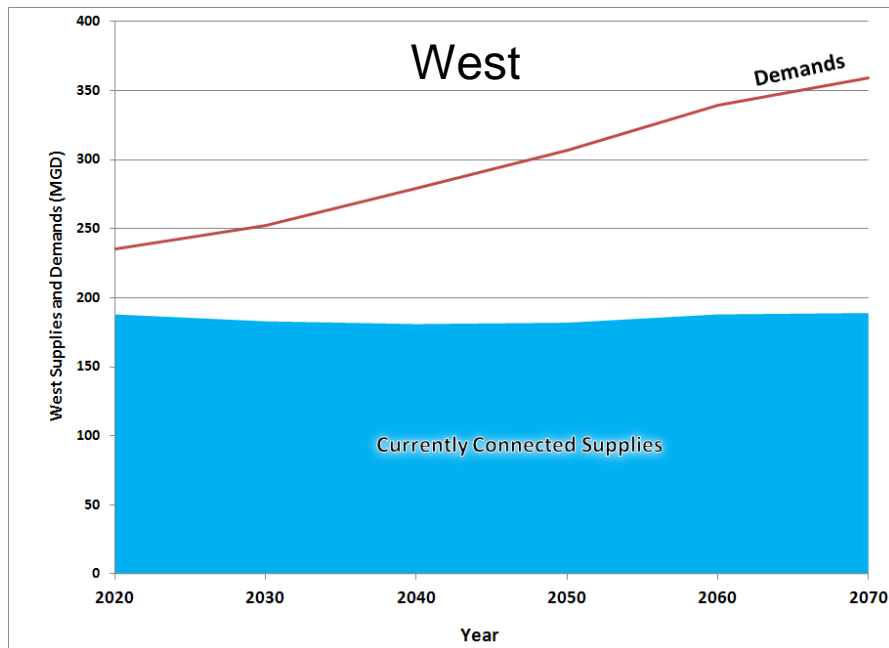


2070



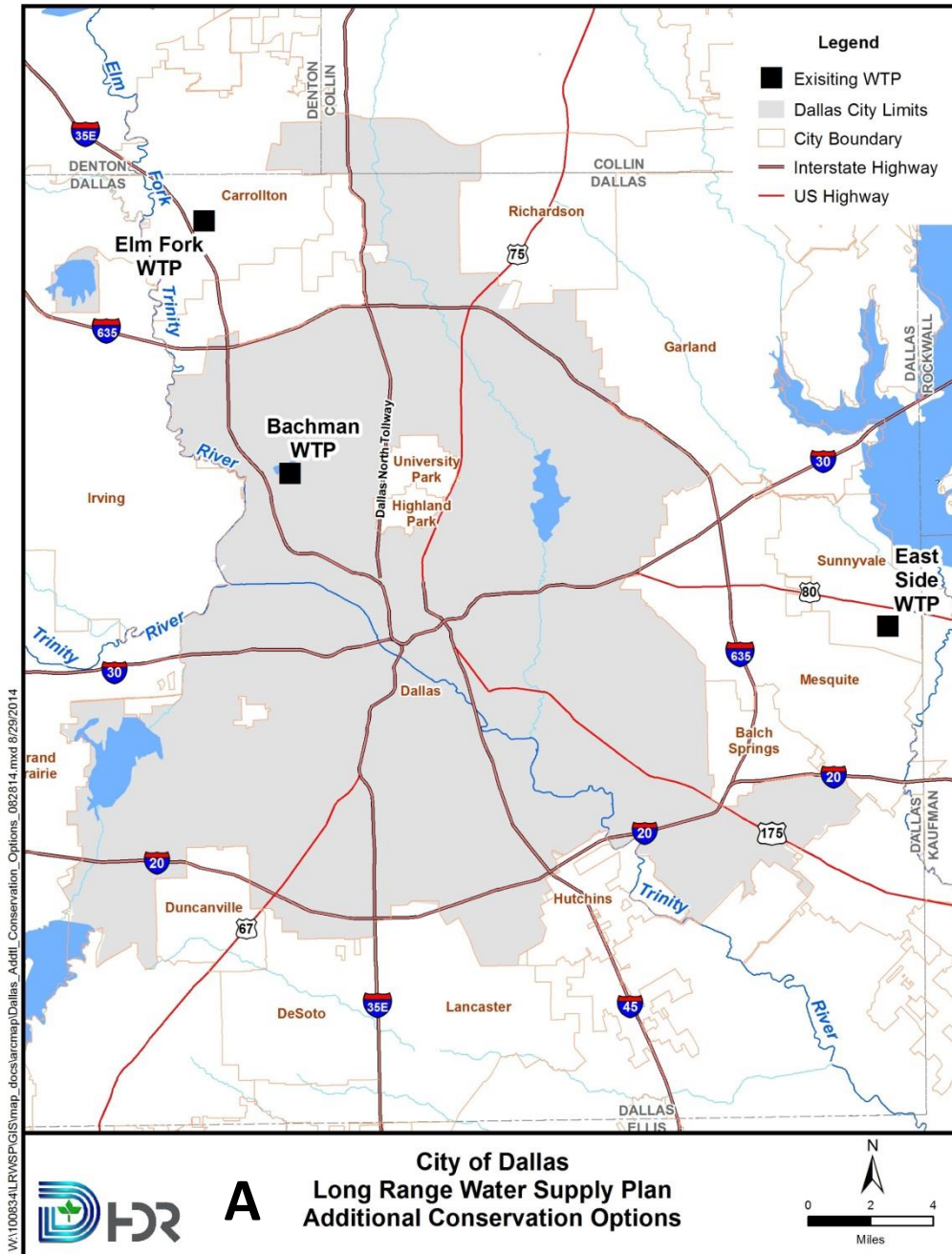
East vs. West System Demand / Supply / Need Summary

- Approximate 50/50 split between East and West Demands
- East currently has more supply than West
- Planned Additional Conservation and Reuse Applied
- West has immediate Needs

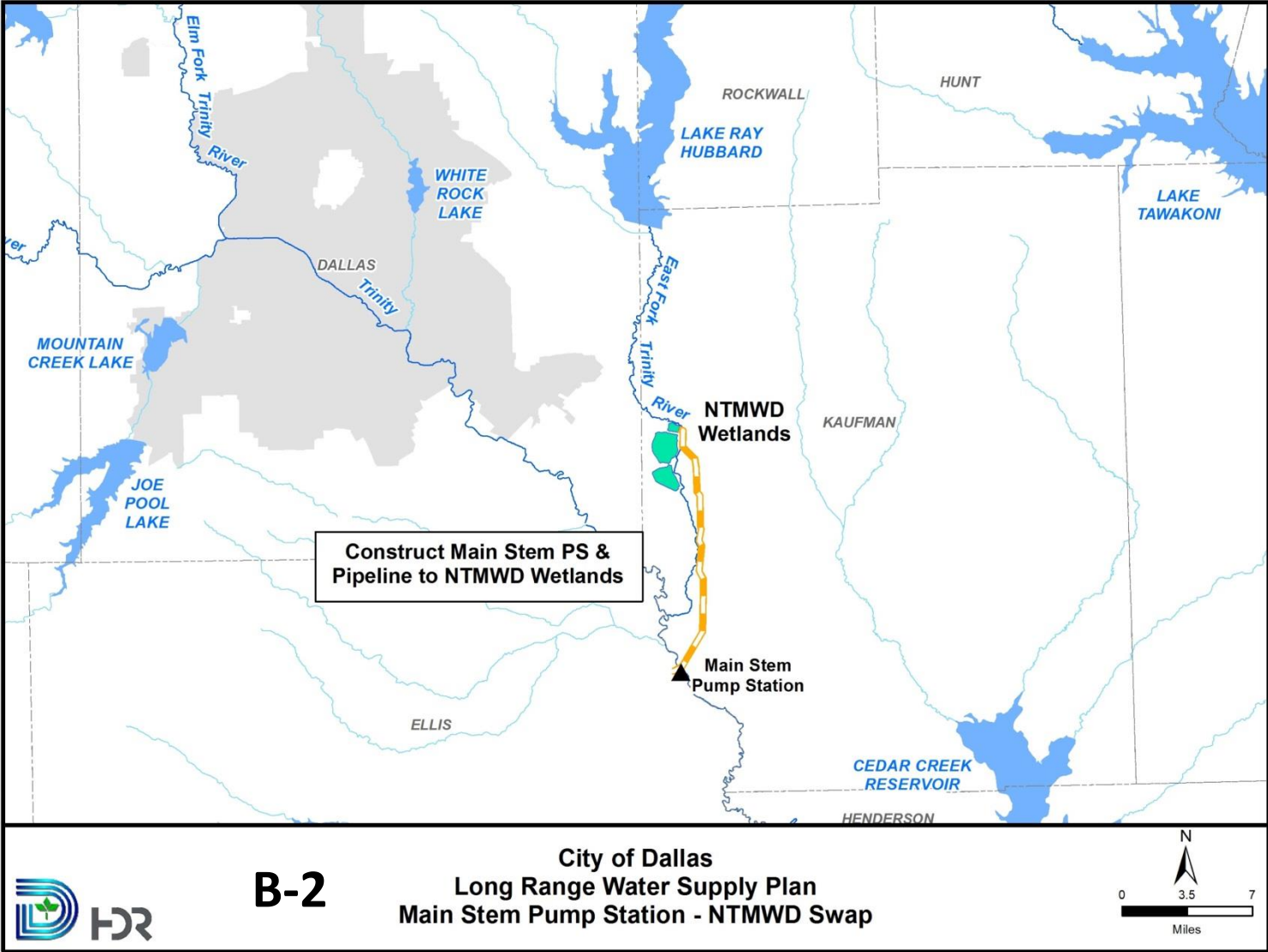


Key Initiatives for Additional Conservation

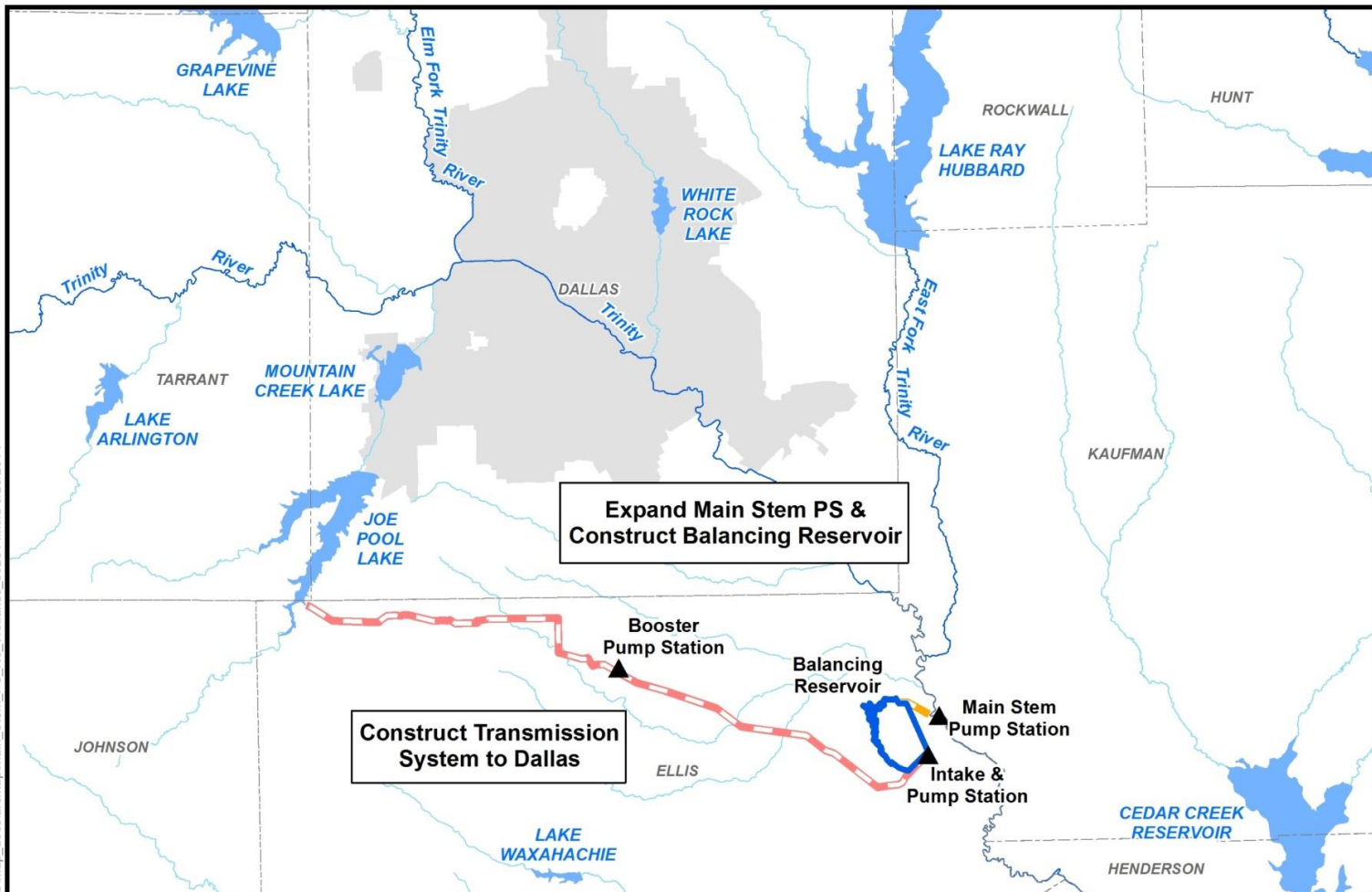
- Water loss control and system efficiencies
 - Including WTP Efficiencies
- New rebate and incentive programs
- Increased education and outreach to DWU Wholesale Customers
- Targeted focus on high-use customer segments
- Increased utilization of mobile technologies aimed at impacting consumer behavior



Indirect Reuse Implementation - Main Stem Pump Station



Indirect Reuse Implementation - Main Stem Pump Station and Balancing Reservoir

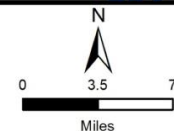


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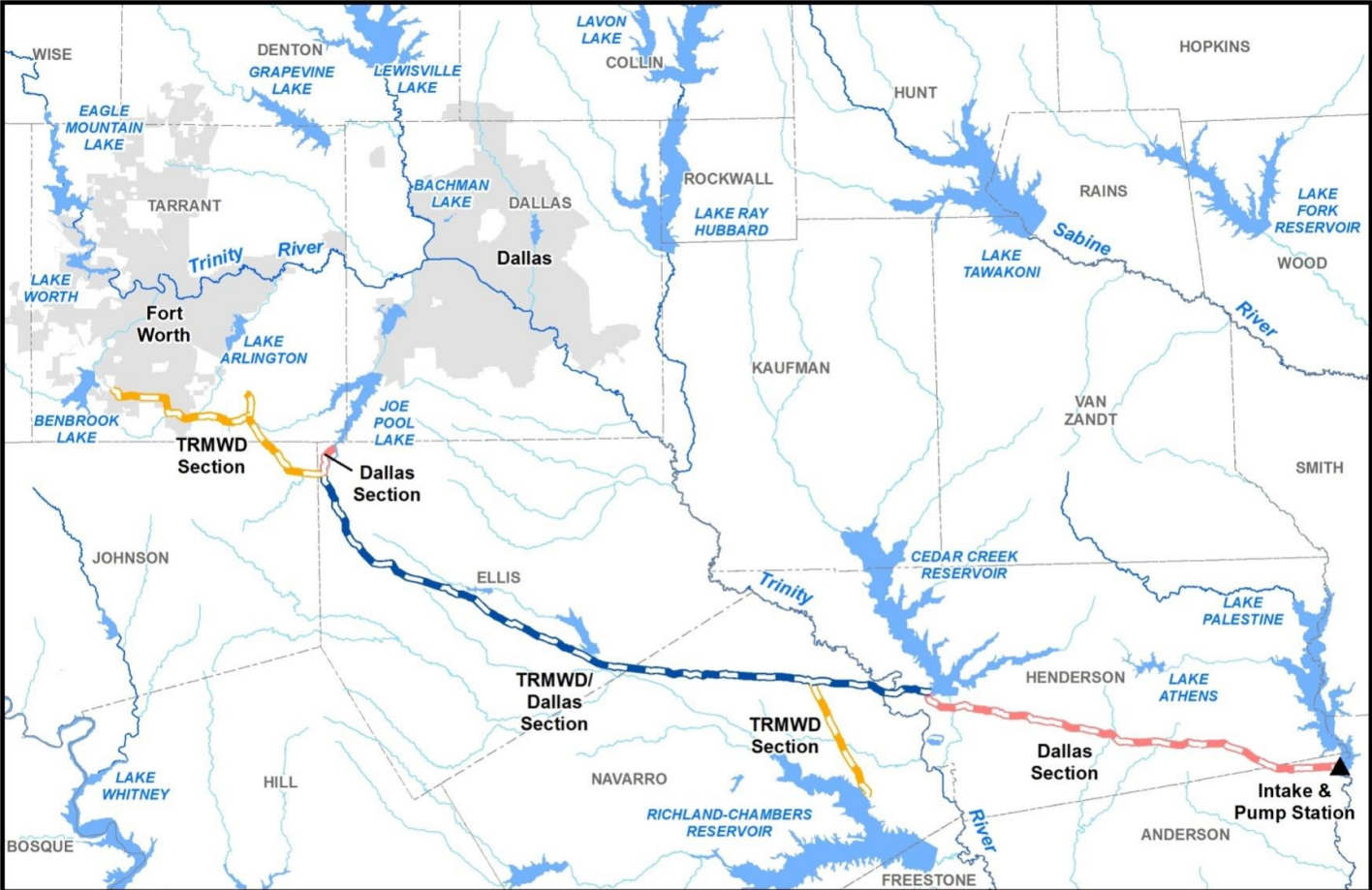


B-1

**City of Dallas
Long Range Water Supply Plan
Main Stem Pump Station & Balancing Reservoir**



Integrated Pipeline (IPL) to deliver Lake Palestine Water to Dallas

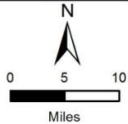


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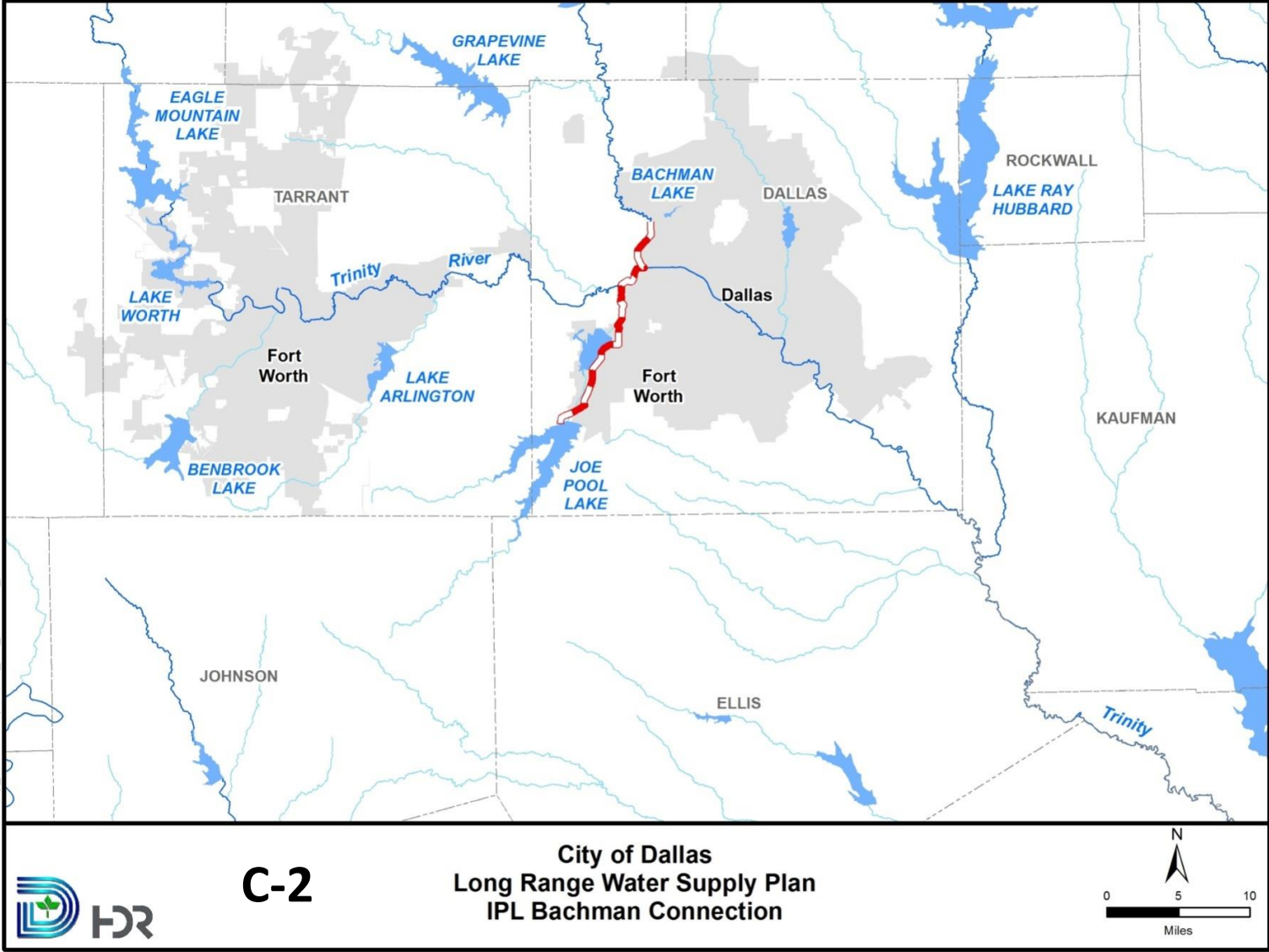


C-1

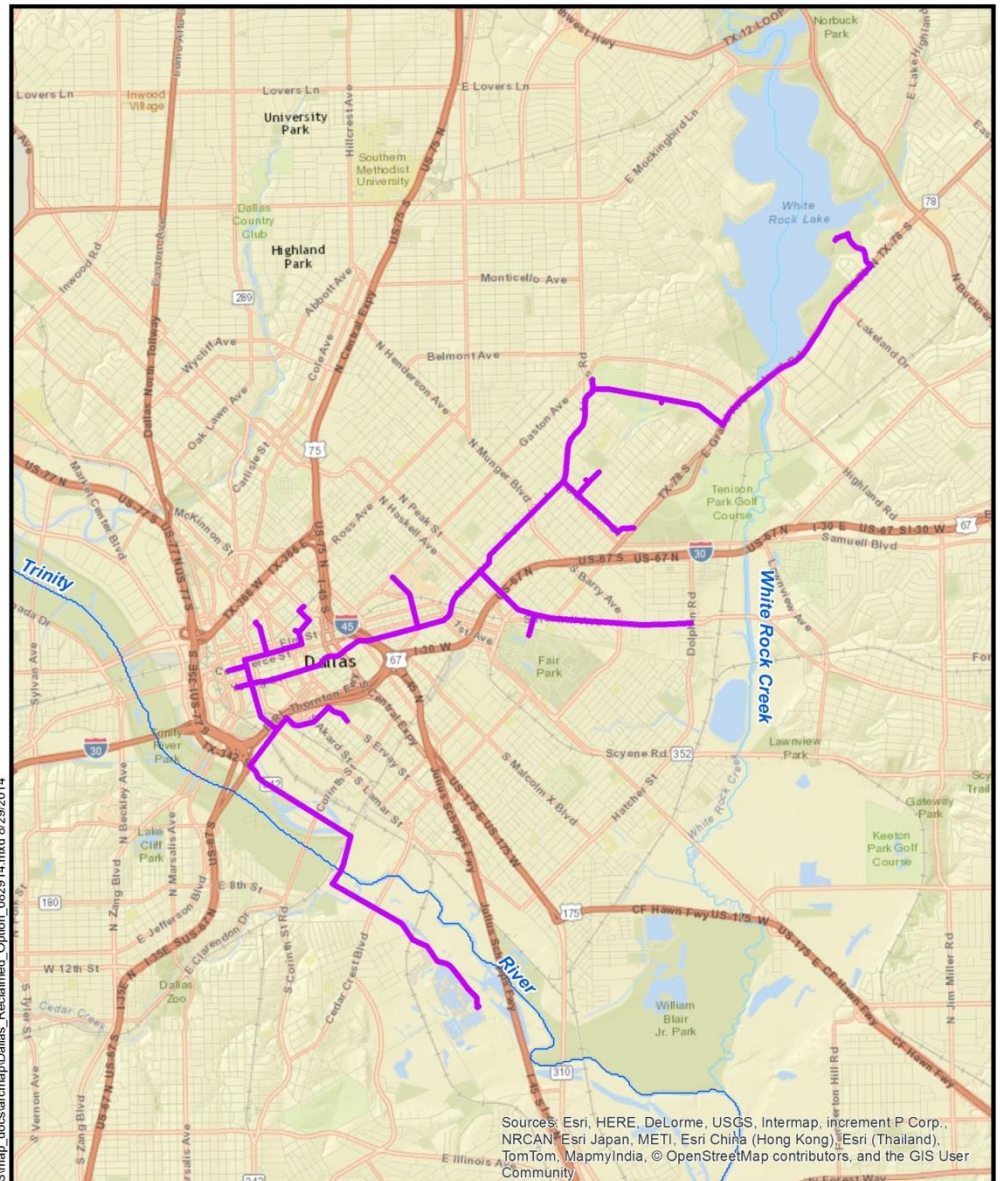
**City of Dallas
Long Range Water Supply Plan
IPL Lake Palestine Connection**



Integrated Pipeline (IPL) – Bachman Connection



Direct Non-Potable Reuse Alternative 1



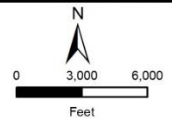
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Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

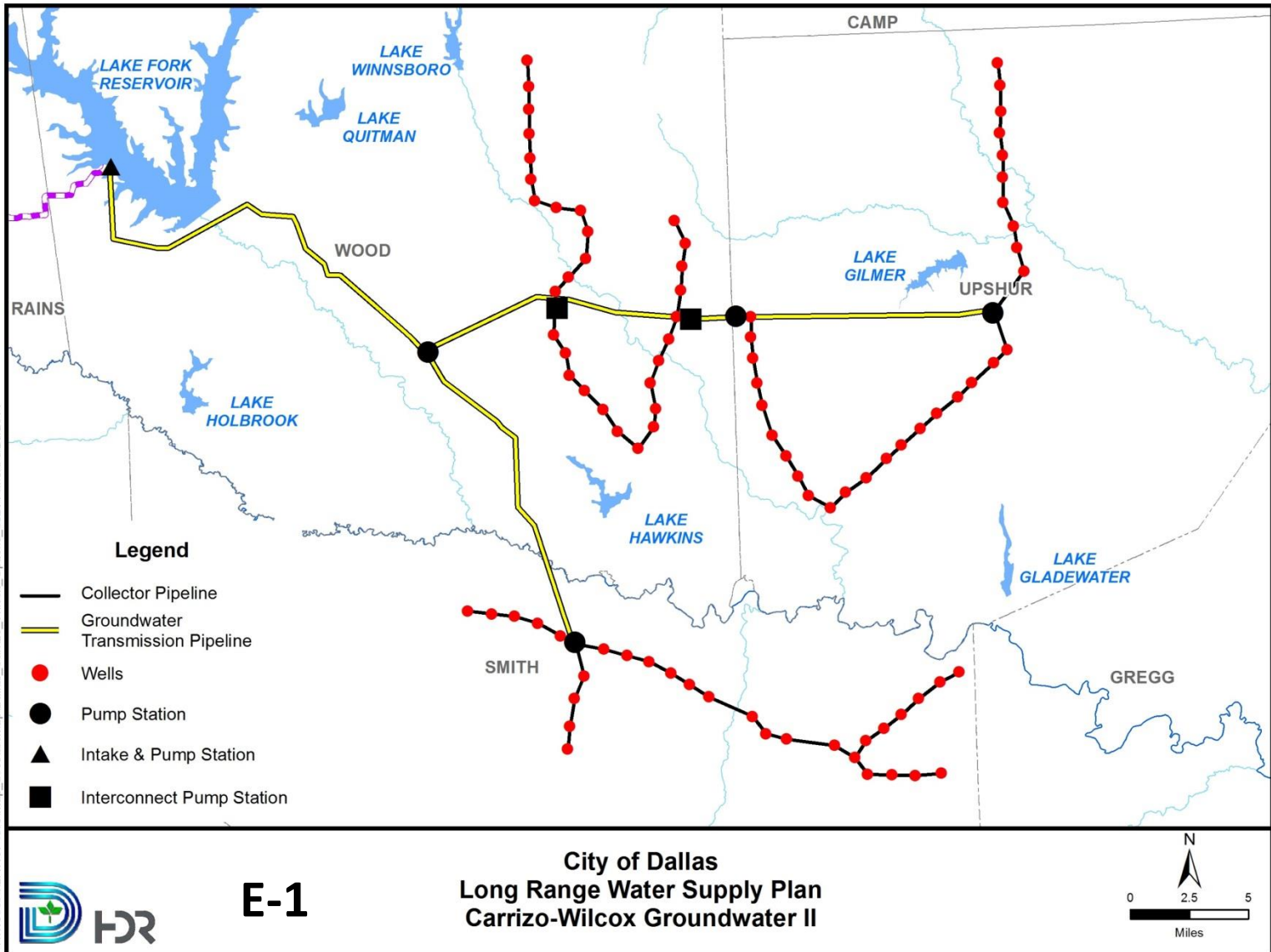


D-1

**City of Dallas
Long Range Water Supply Plan
Direct Non-Potable Reuse - Alternative 1**



Carrizo Wilcox Groundwater 2 Strategy

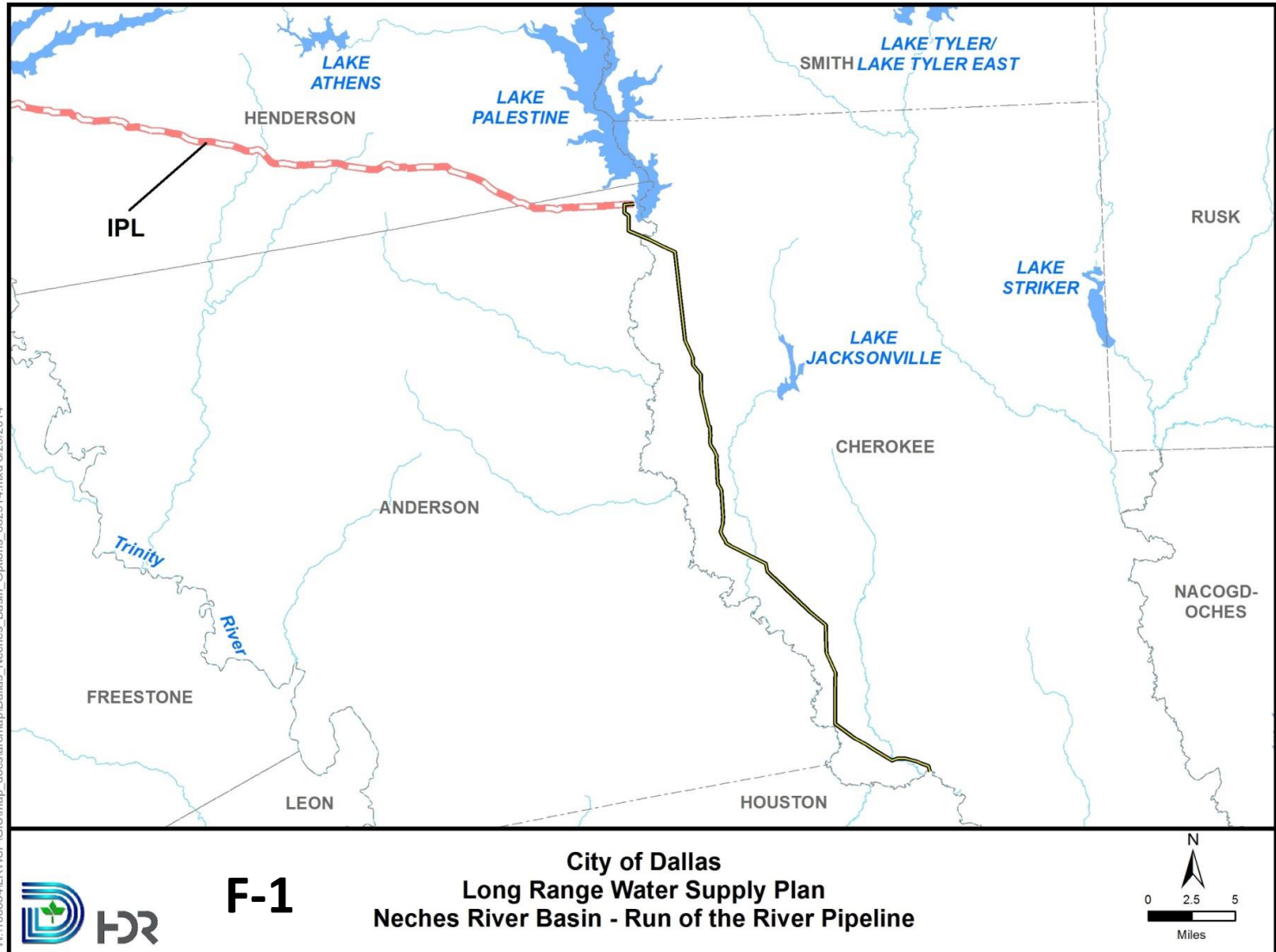


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E-1

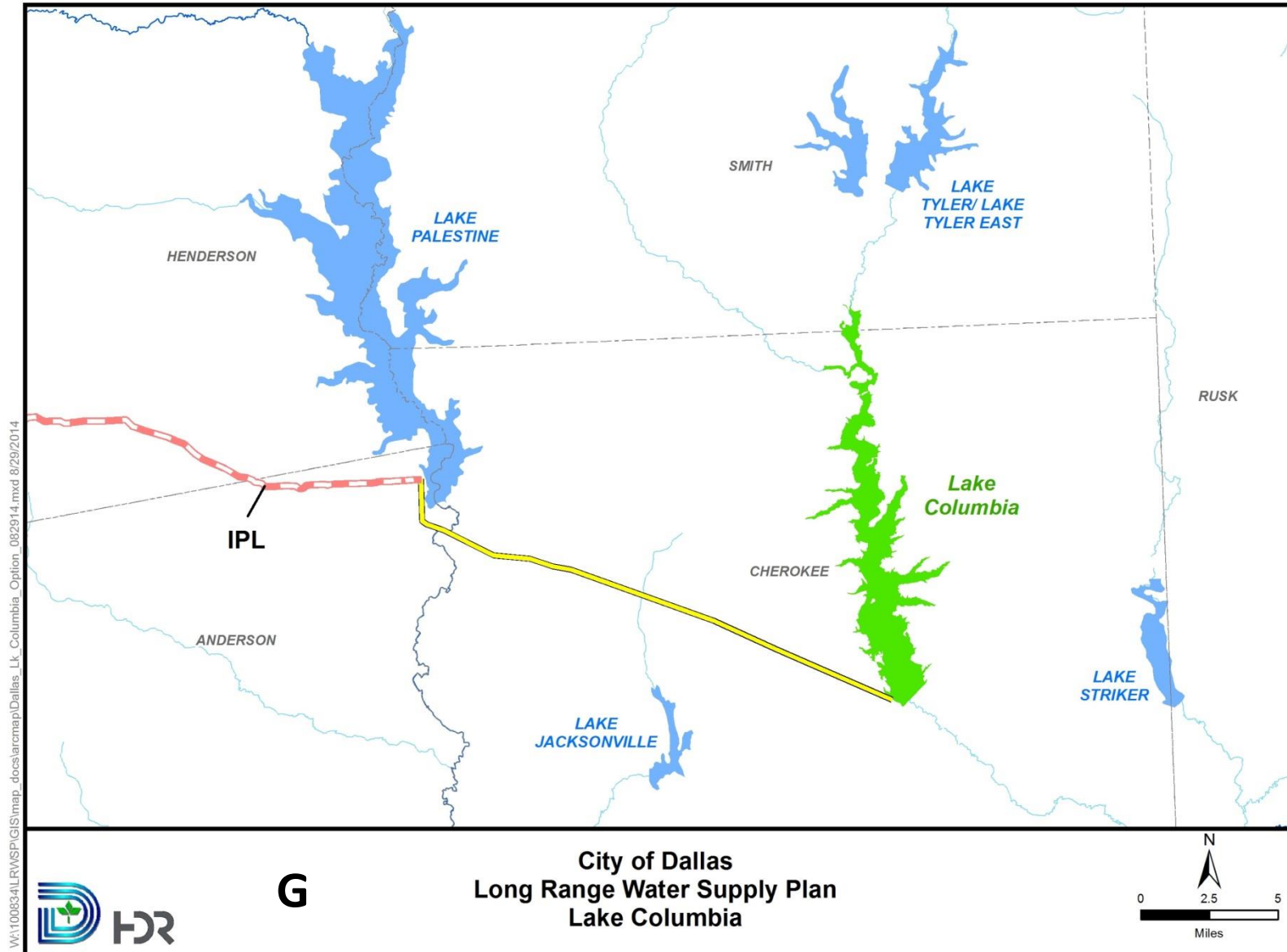
Neches River Basin - Run of the River Diversion & Pipeline



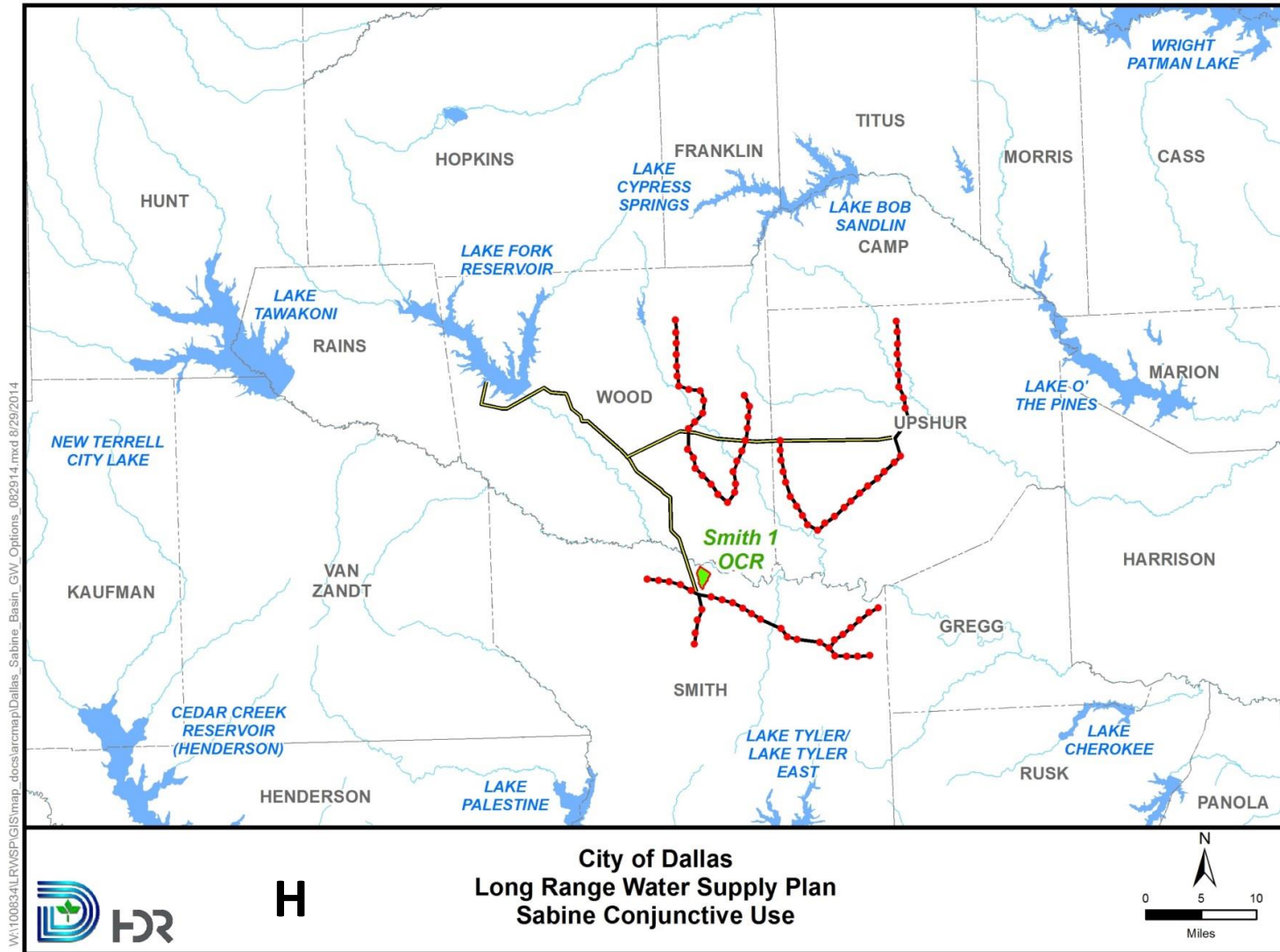
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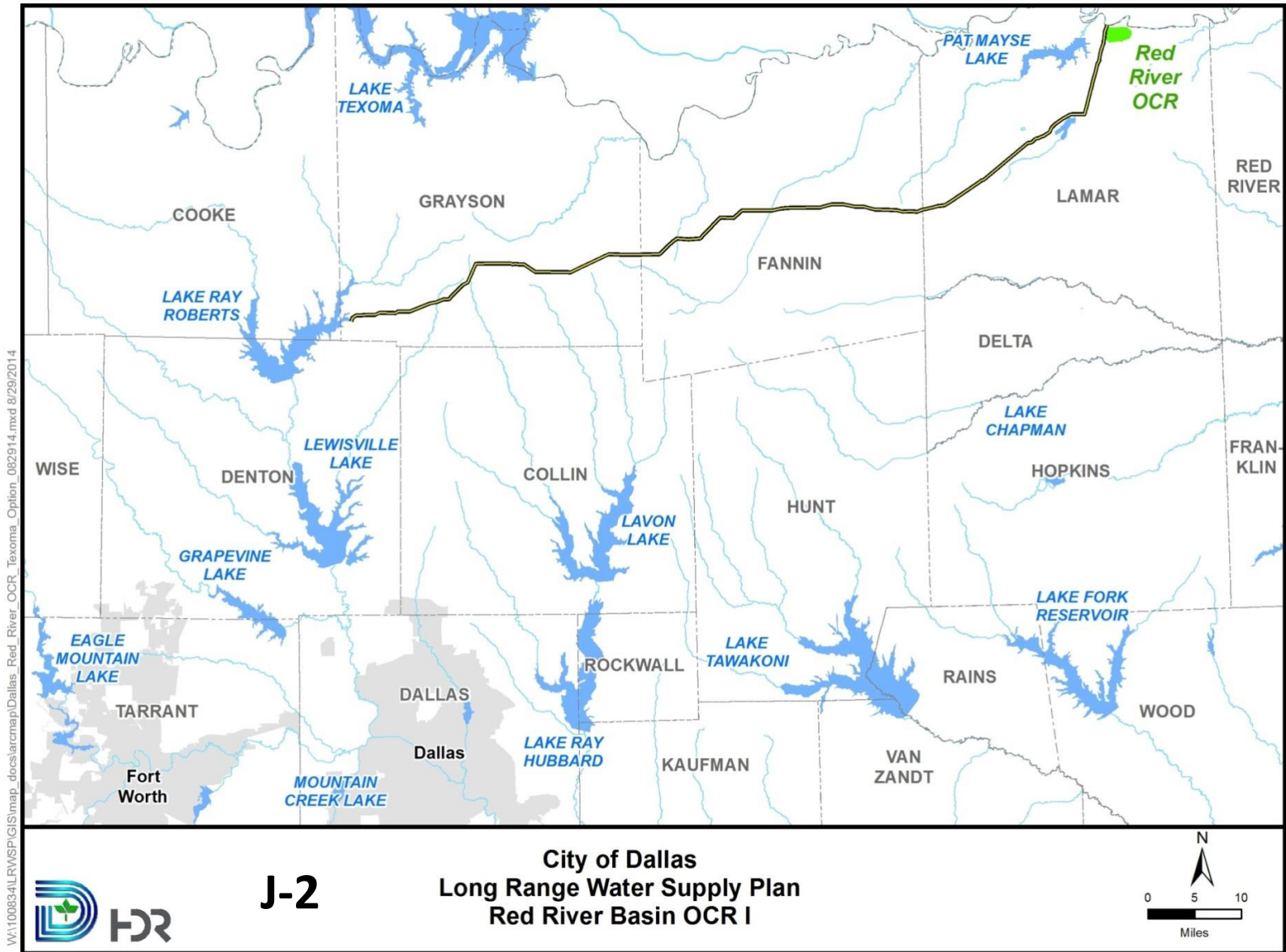
Lake Columbia



Sabine Basin – Sabine OCR Conjunctive Use of Carrizo-Wilcox Groundwater



Red River OCR 1

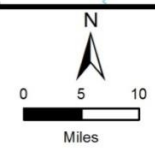


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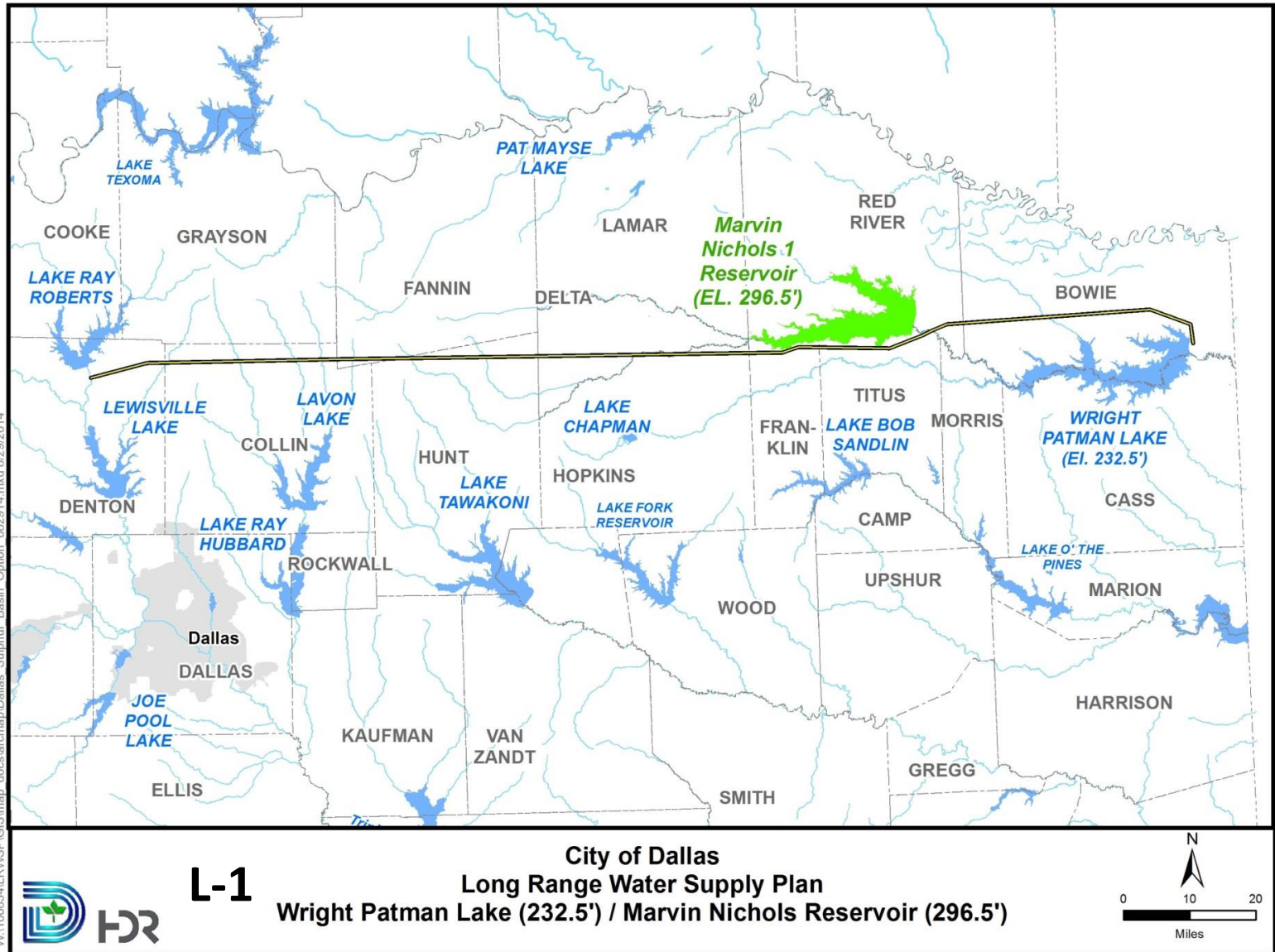


J-2

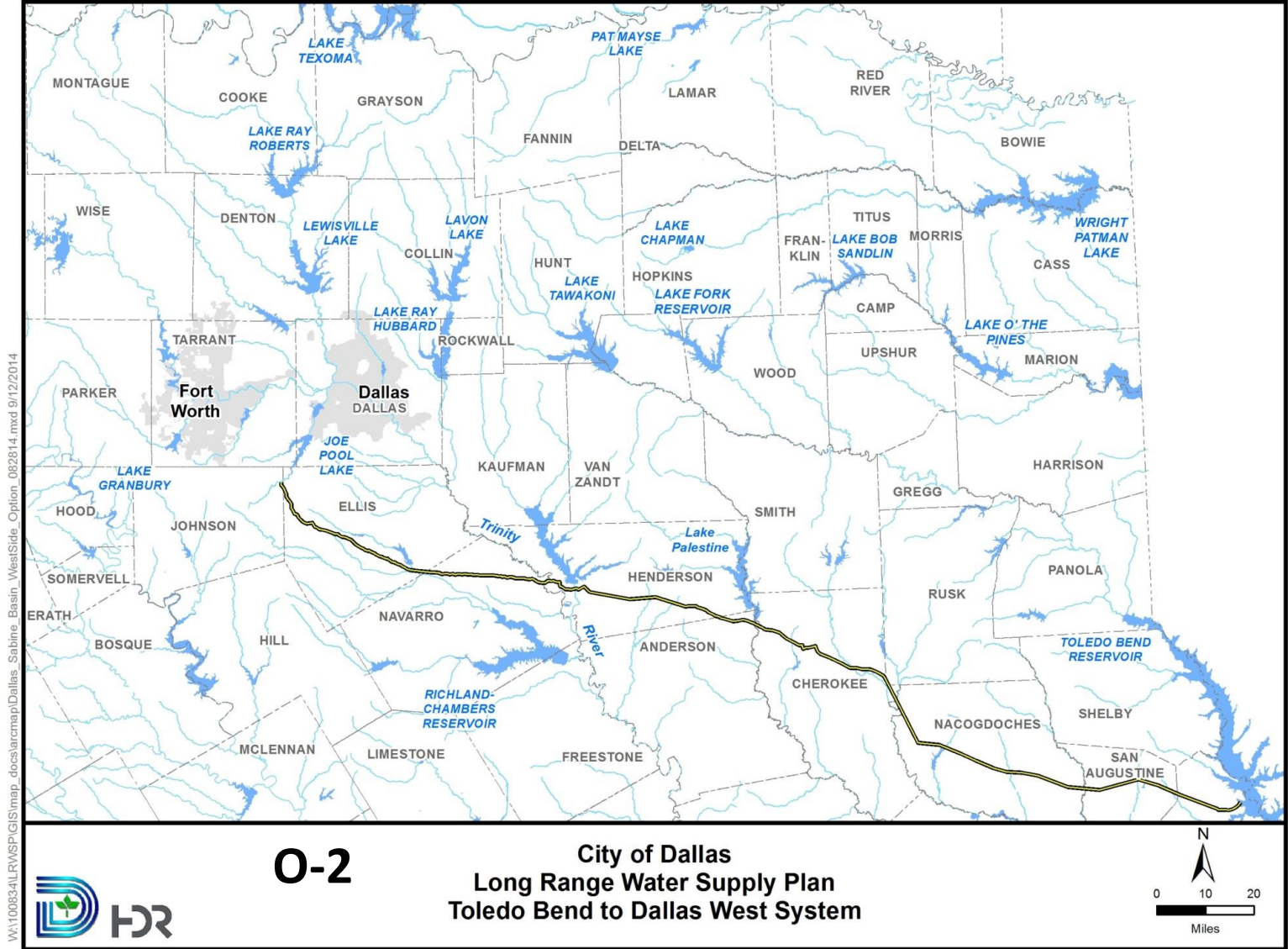
City of Dallas
Long Range Water Supply Plan
Red River Basin OCR I



Sulphur Basin – Patman (232.5) / MN (296.5)



Sabine Basin – Toledo Bend Reservoir to Dallas Westside (Regional Strategy)



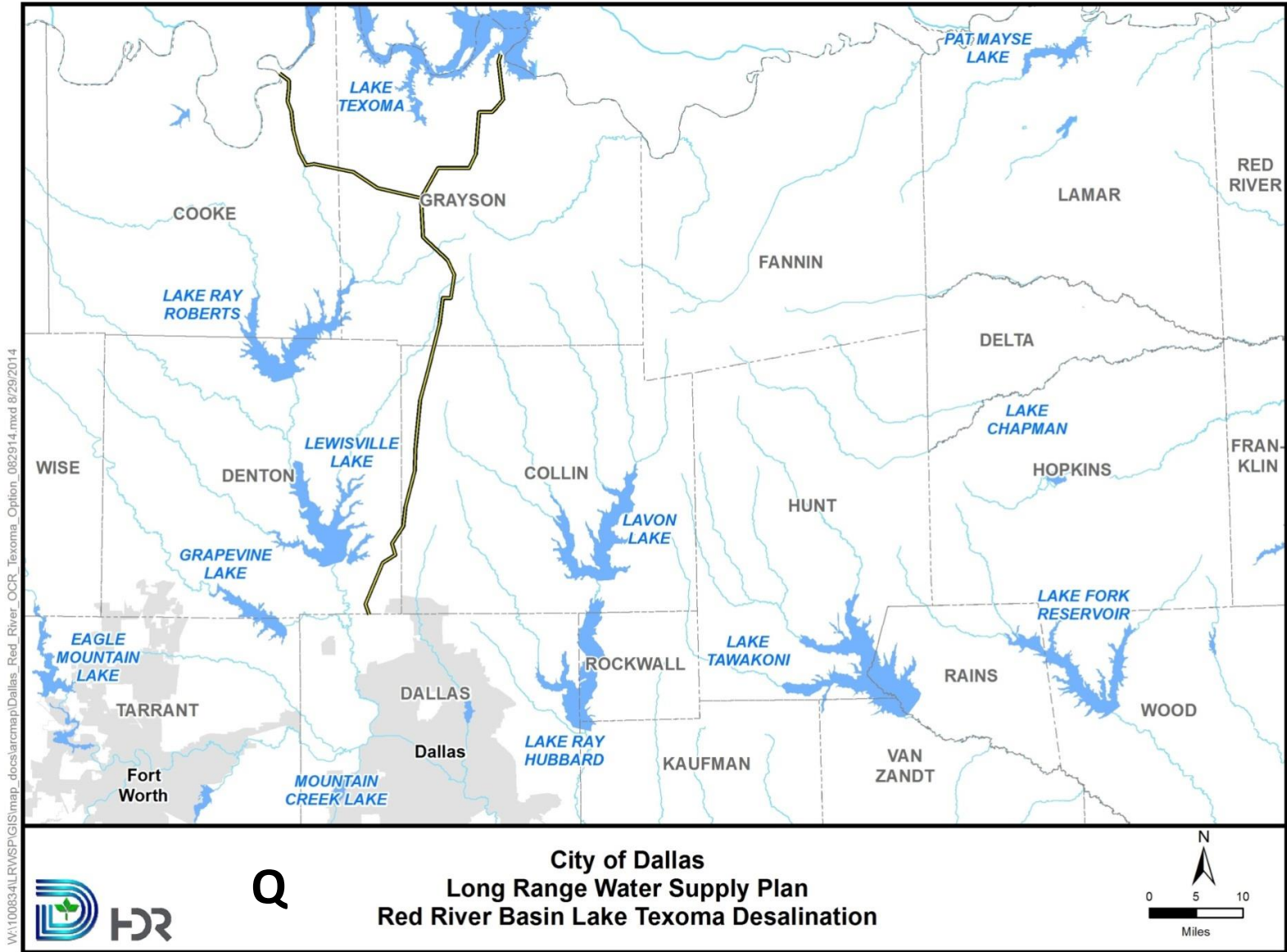
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O-2

**City of Dallas
Long Range Water Supply Plan
Toledo Bend to Dallas West System**

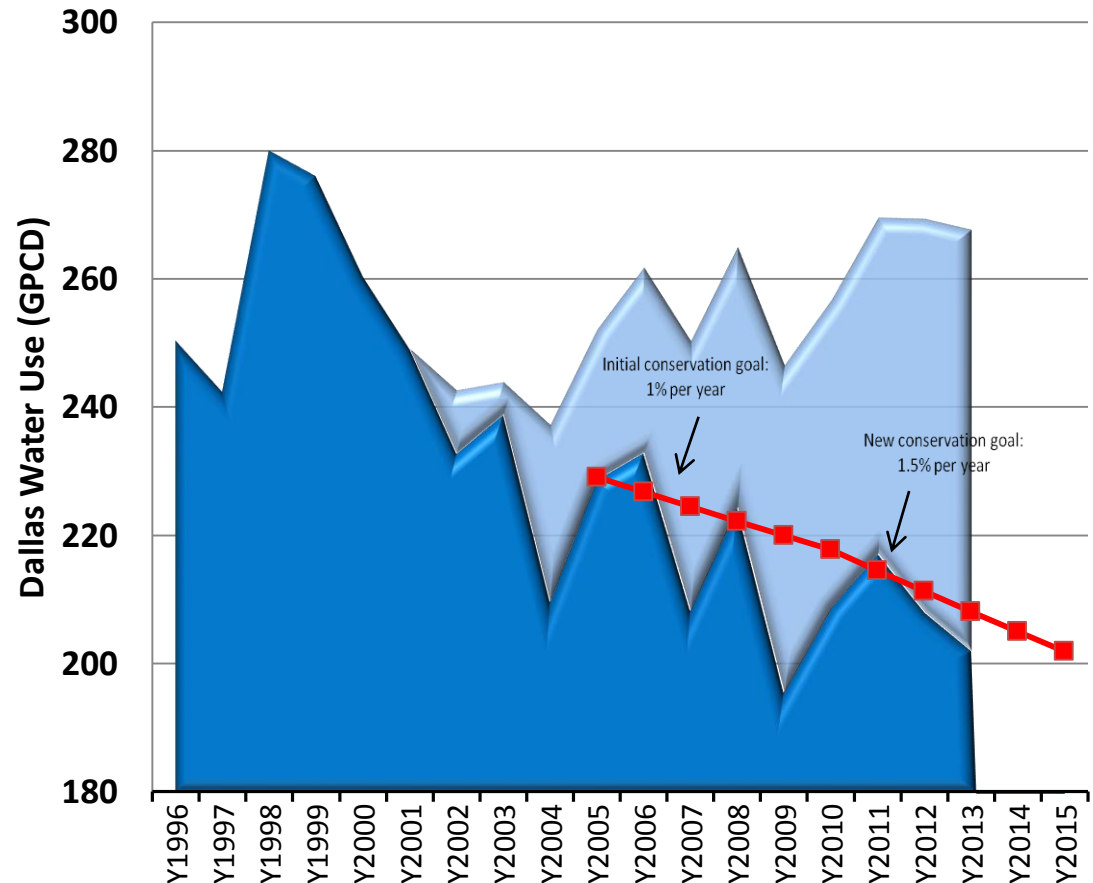
Red River Basin – Lake Texoma Desalination



Water Conservation Accomplishments

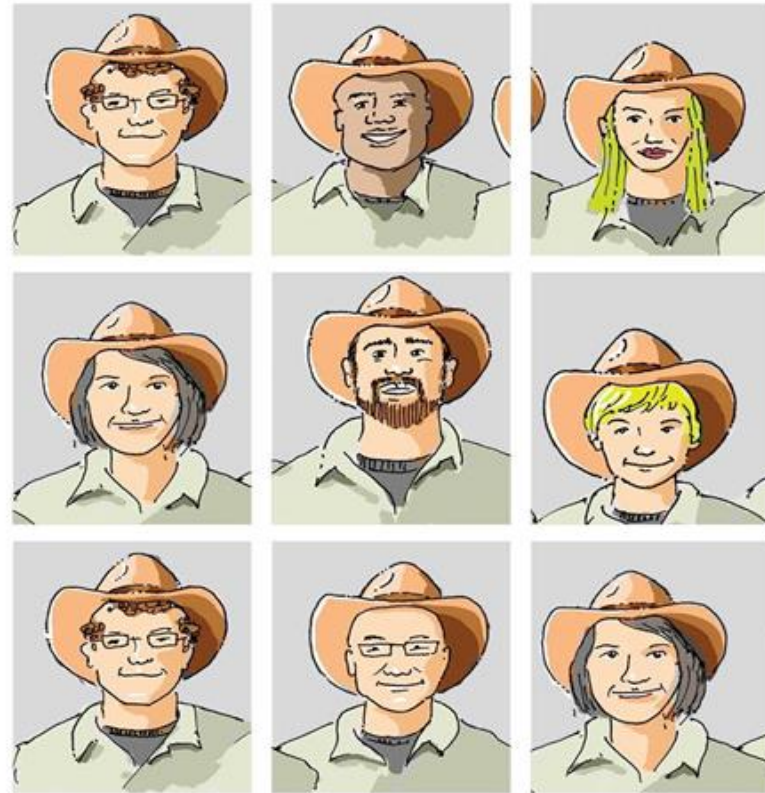
Conservation measures adopted by the Council in Oct 2001 have been positive

- Dallas saved an estimated 220 billion gallons of water since 2001 (extends supply by almost 1.5 years)
- GPCD has been reduced approximately 20% from FY01 to FY13
- As a result, Dallas has been able to mitigate the impact of drought weather conditions on water supply
- Since implementation of the Twice Weekly Watering Program in April 2012, water consumption is 5 to 6% lower despite similar temperatures and less than half the rainfall
- Non-watering days are 25 to 40 MGD or an average of 8% less than watering days



2014 Regional Campaign Theme

- **Team Lawn Whisperer**
 - Campaign will
 - Reinforce “maximum twice weekly or less” watering message
 - Demonstrate how to maintain a beautiful water-wise landscape and save money
 - Encourage everyone to join the team and do their part to save water



Water twice a week or less and you're on the team.

Getting on some teams requires lots of running and sit-ups and stuff like that. Getting on Team Lawn Whisperer is easy. Just water twice a week or less. And sign up for special teams by mulching your bushes and flower beds. Ready to join? Save water. Nothing can replace it.

FY 2014-15 Water Conservation Strategic Plan



- Current 2010 Water Conservation Five-Year Strategic Plan due for update in 2015
- Tasks to evaluate proposed update
 - Analyze long-term demand reductions, water use and water loss data
 - Evaluate impacts of maximum twice weekly watering on water use demands
 - Assess savings, costs, staff time according to identified measures
 - Evaluate implementation strategies
 - Receive and incorporate stakeholder input
 - Modify prior recommendations and identify new measures
 - Develop draft Plan update

Infrastructure Recommendations

Project	Drivers	Recommended Implementation	Capital Cost	Risk if Delayed
Elm Fork WTP Pre-sedimentation Basin	G / R	2017	\$24 M	<ul style="list-style-type: none"> • May require WTP improvements • No recognition of reduction in coagulant and liquid O2 use
East Side WTP WQI	G / R / M	2018	\$93 M	<ul style="list-style-type: none"> • More frequent filter backwashing • Potential for less than optimum biological filter performance
72-inch Treated Water Pipeline (Bachman WTP to Elm Fork WTP)	G / R / M	2018	\$30 M	<ul style="list-style-type: none"> • Hydraulic challenges for distribution • Increasing reliability concerns • Potential for construction outages
Elm Fork WTP Residuals Handling Improvements	G / R / M	2018	\$90 M	<ul style="list-style-type: none"> • Site space not available at Elm Fork WTP for planned improvements
Elm Fork WTP Pump Station 1	R / M	2018	\$35 M	<ul style="list-style-type: none"> • Increasing risk of failure • Reduces reliability
Iron Bridge Pump Station Rehab	R / M	2018	\$47 M	<ul style="list-style-type: none"> • Electrical and equipment failures
East Side WTP Residuals Basins and Sludge PS Improvements	M	2022	\$75 M	<ul style="list-style-type: none"> • Continued WQ challenges in the distribution system • Limited reliable production
Elm Fork WTP WQI6	G / R / M	2024	\$240 M	<ul style="list-style-type: none"> • Increased potential for water supply shortages
144-in Pipeline (from Tawakoni Interconnect to Balancing Reservoir and on to East Side WTP)	G / M	2030	\$420 M	<ul style="list-style-type: none"> • East Side production remains limited at 440 mgd
Wintergreen Pump Station and Southwest Pipelines	G	2030	\$310 M	<ul style="list-style-type: none"> • Increasing risk of embankment failure and dam safety issues • Limits storage capacity available if system is out of service
Tawakoni Balancing Reservoir Expansion	G / M	2030	\$66 M	<ul style="list-style-type: none"> • Increasing risk of failure(s) • Power supply is not adequate for peak requirements at 540 mgd
East Side WTP Electrical Distribution System Improvements and Substation 3	G / M	2030	\$18 M	<ul style="list-style-type: none"> • Would require a variance to operate filters at a higher loading • Potential for decreased filter performance and need for increased backwash frequency
East Side WTP Stage V Filters	G / R	2030	\$40 M	<ul style="list-style-type: none"> • Not enough treatment capacity to meet demands
Western WTP Expansion	G	2045	\$405 M	<ul style="list-style-type: none"> • Increased potential for water supply shortages

G – Growth R – Regulation M – Maintenance and Reliability

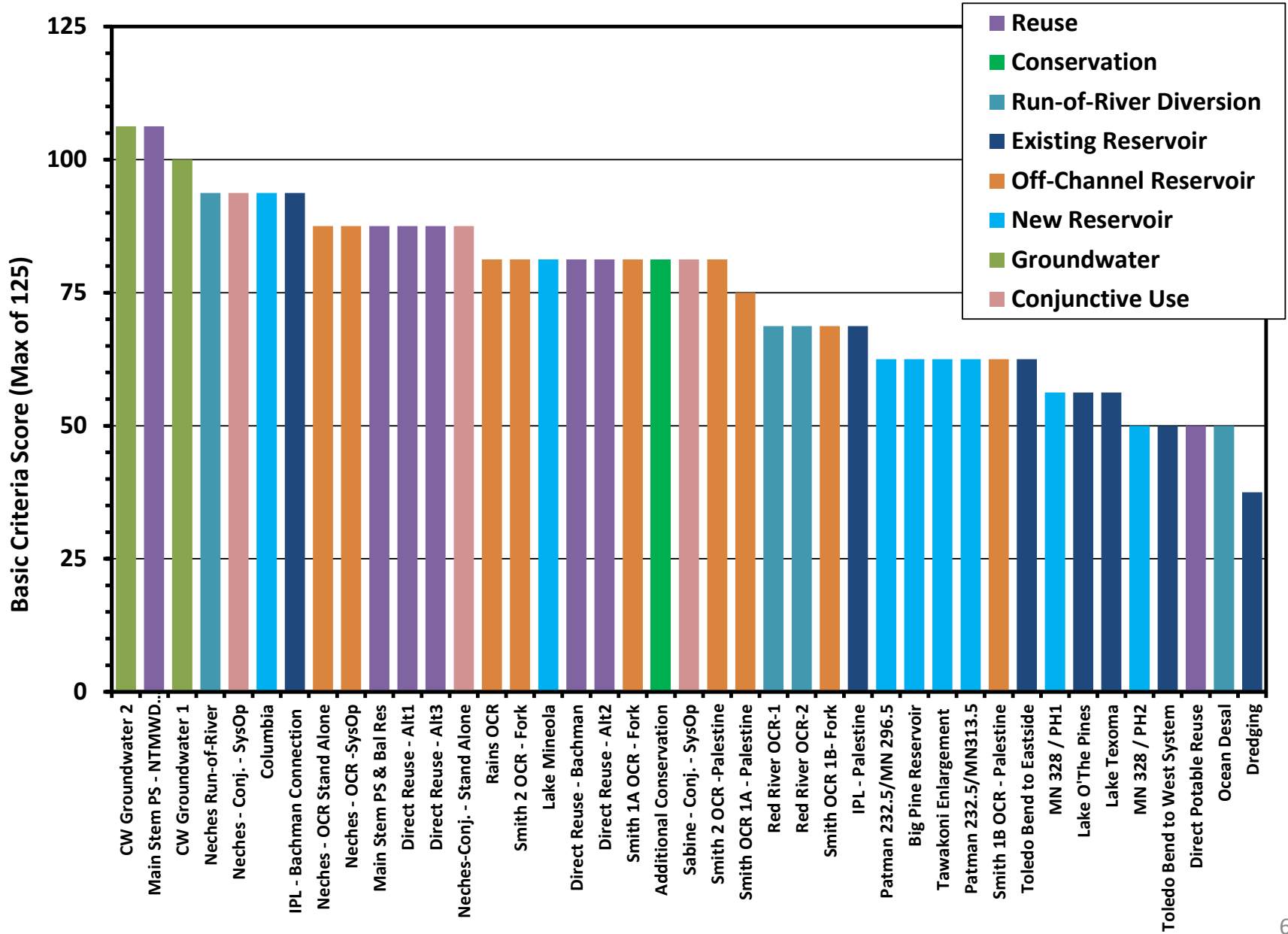
Potential Water Management Strategies

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 - Alternate 1	2,609	2	\$701	\$2.15	11	4	6
D-2	Direct Reuse - Alternate 3	1,864	2	\$660	\$2.03	12	5	7
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
D-3	Direct Reuse - Bachman	844	1	\$837	\$2.57	17	6	10
E-2	Carrizo Wilcox Groundwater - 1	20,000	18	\$570	\$1.75	3	17	11
D-4	Direct Reuse - Alternate 2	1,881	2	\$927	\$2.85	18	7	12
F-2	Neches - Conjunctive Use -System Operations (Groundwater and Off Channel Reservoir)	87,575	78	\$544	\$1.67	5	20	13
F-3	Neches - Off Chanel Reservoir -System Operations	79,025	71	\$554	\$1.70	9	19	14
F-4	Neches - Off Channel Reservoir Stand Alone	64,400	58	\$585	\$1.80	8	18	15
G	Lake Columbia	56,000	50	\$560	\$1.72	6	28	16
F-5	Neches-Conjunctive Use - Stand Alone (Run-of-River and Groundwater)	71,000	63	\$619	\$1.90	13	22	17
H	Sabine - Conjunctive Use -System Operations (Groundwater and Off Channel Reservoir)	104,200	93	\$734	\$2.25	21	13	18
I	Rains Off Channel Reservoir	29,200	26	\$846	\$2.60	14	21	19

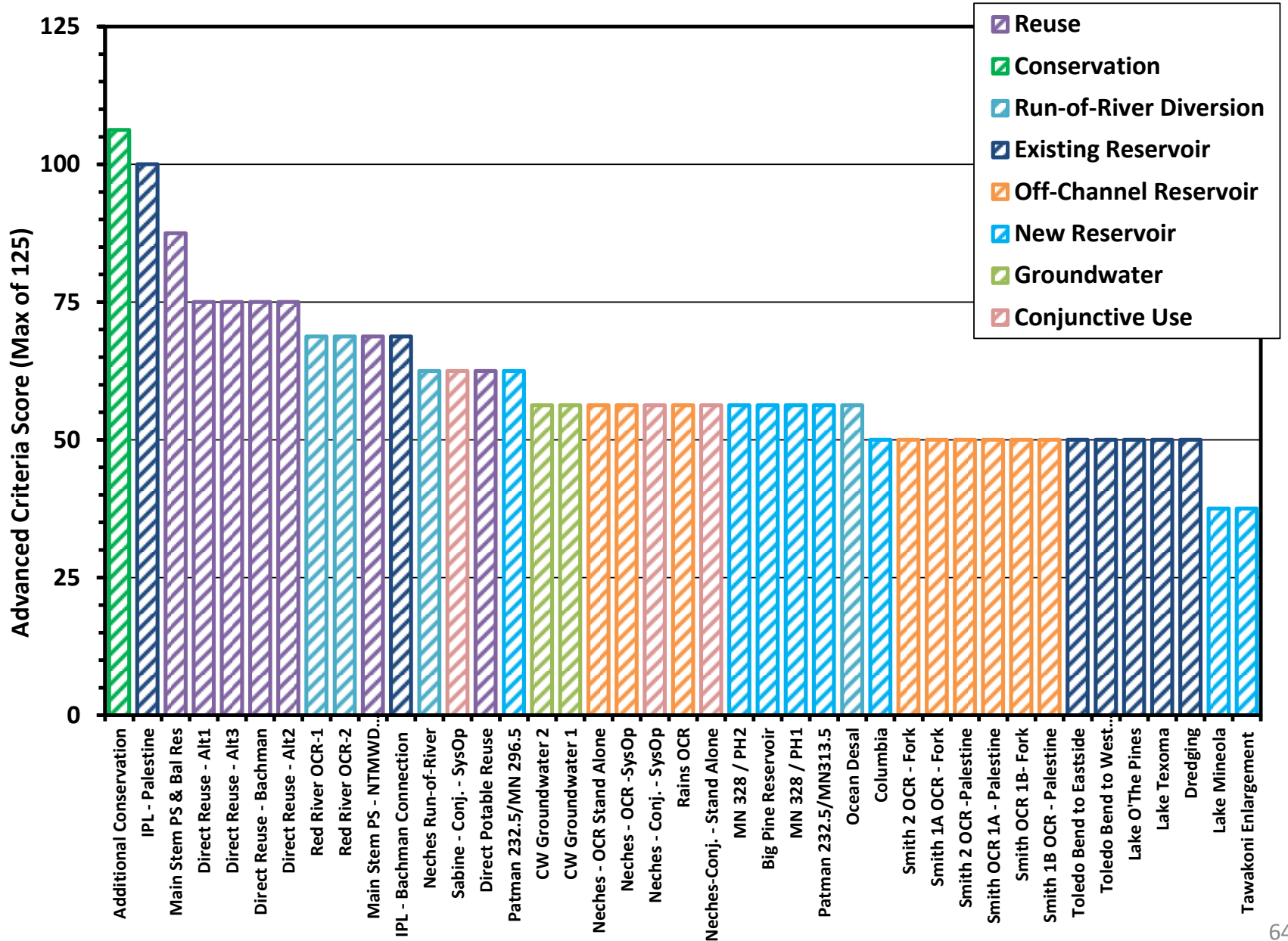
Potential Water Management Strategies (Continued)

Strategy ID	Water Management Strategy	Projected Supply		Cost		Ranking		
		Acre-feet	MGD	per acre foot	per 1,000 gal	Basic	Advanced	Combined
J-1	Red River Off Channel Reservoir - 2	310,000	277	\$551	\$1.69	25	9	20
J-2	Red River Off Channel Reservoir -1	114,000	102	\$734	\$2.25	24	8	21
K-1	Smith 2 Off Channel Reservoir - to Lake Fork	55,700	50	\$688	\$2.11	15	29	22
K-2	Smith 1A Off Channel Reservoir - to Lake Fork	46,300	41	\$853	\$2.62	19	30	23
K-3	Smith 2 OCR -Palestine	55,700	50	\$747	\$2.29	22	31	24
L-1	Wright Patman (232.5) / Marvin Nichols (296.5)	114,000	102	\$742	\$2.28	28	15	25
K-4	Smith Off Channel Reservoir 1A - to Lake Palestine	46,300	41	\$941	\$2.89	23	32	26
M-1	Lake Mineola	72,000	64	\$729	\$2.24	16	40	27
L-2	Wright Patman (232.5) / Marvin Nichols (313.5)	114,000	102	\$687	\$2.11	31	26	28
N	Big Pine Reservoir	35,840	32	\$1,201	\$3.69	29	24	29
K-5	Smith Off Channel Reservoir 1B - to Lake Fork	67,200	60	\$913	\$2.80	26	33	30
L-3	Marvin Nichols (328) / Parkhouse 1	114,000	102	\$644	\$1.98	34	25	31
D-5	Direct Potable Reuse	44,800	40	\$622	\$1.91	39	14	32
K-6	Smith 1B Off Channel Reservoir - to Lake Palestine	67,200	60	\$1,004	\$3.08	32	34	33
O-1	Toledo Bend to Eastside WTP	200,000	179	\$863	\$2.65	33	35	34
L-4	Marvin Nichols (328) / Parkhouse 2	114,000	102	\$635	\$1.95	37	23	35
P	Lake O'The Pines	89,600	80	\$1,225	\$3.76	35	37	36
Q	Lake Texoma Desalination	146,000	130	\$1,186	\$3.64	36	38	37
R	Ocean Desal	200,000	179	\$2,157	\$6.62	40	27	38
O-2	Toledo Bend to West System	200,000	179	\$1,023	\$3.14	38	36	39
M-2	Tawakoni Enlargement	57,600	51	\$1,357	\$4.16	30	41	40
S	Dredging	2,900	3	\$12,182	\$37.39	41	39	41

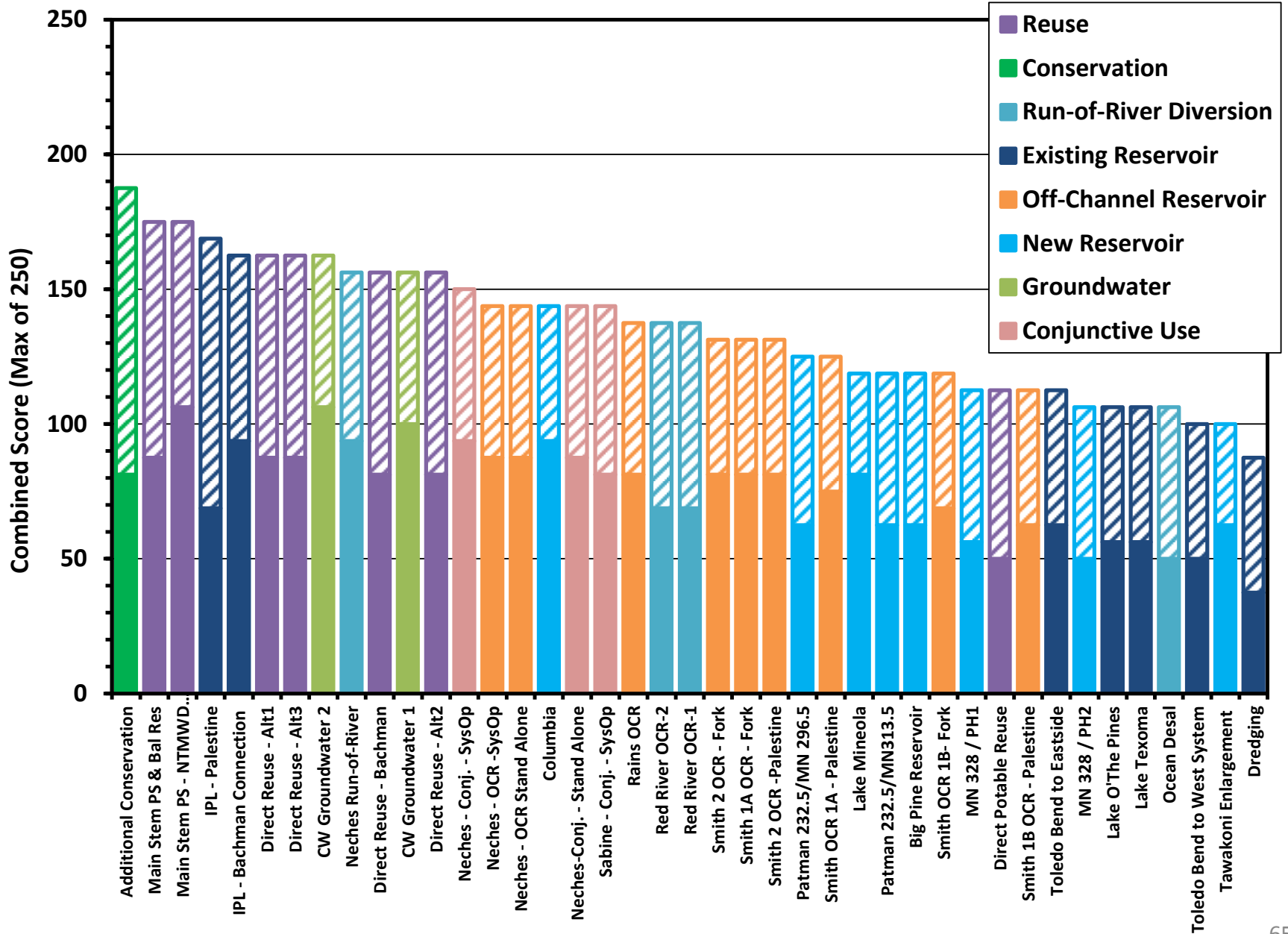
Ranking of Strategies by Basic Criteria Score



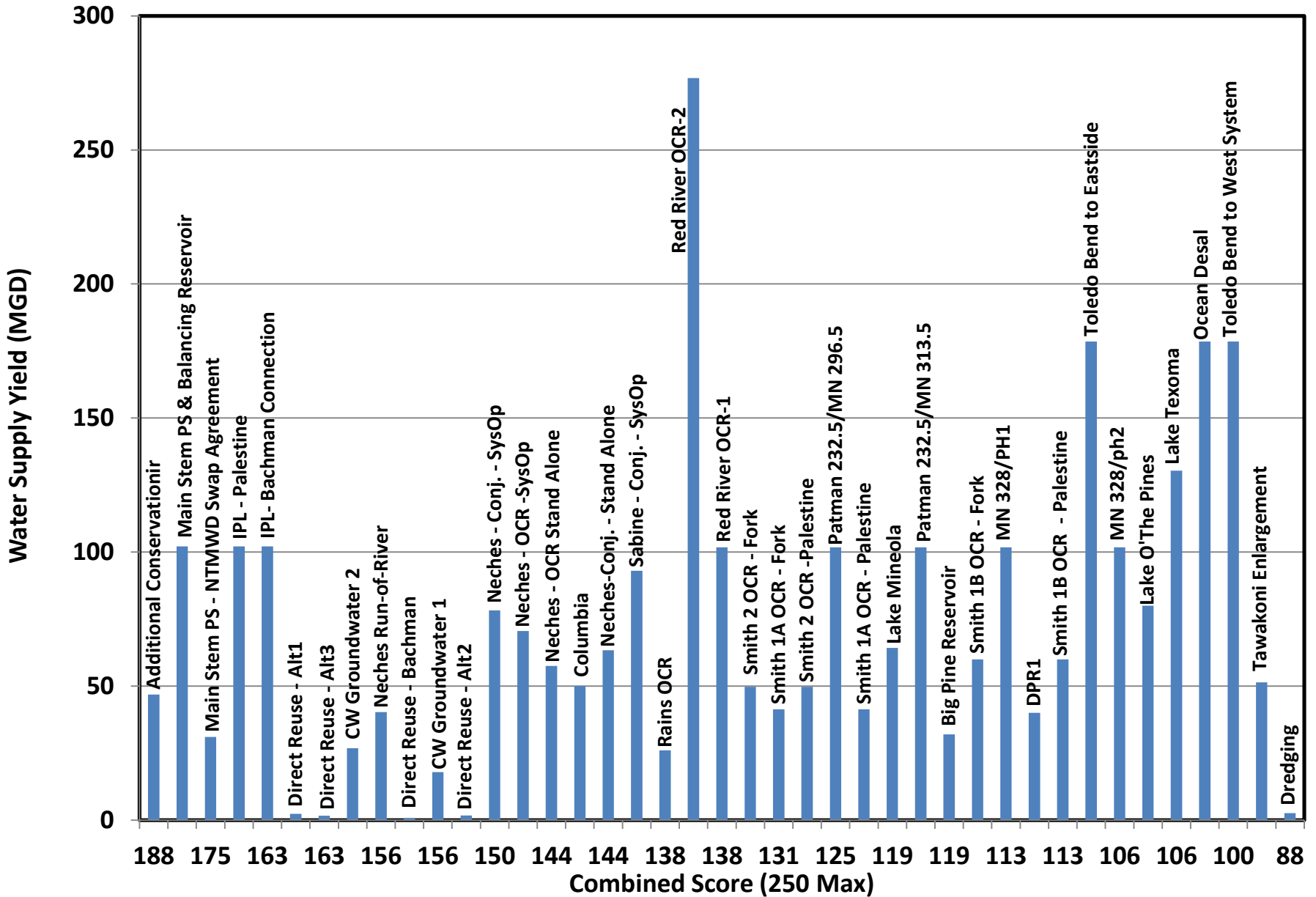
Ranking of Strategies by Advanced Criteria Score



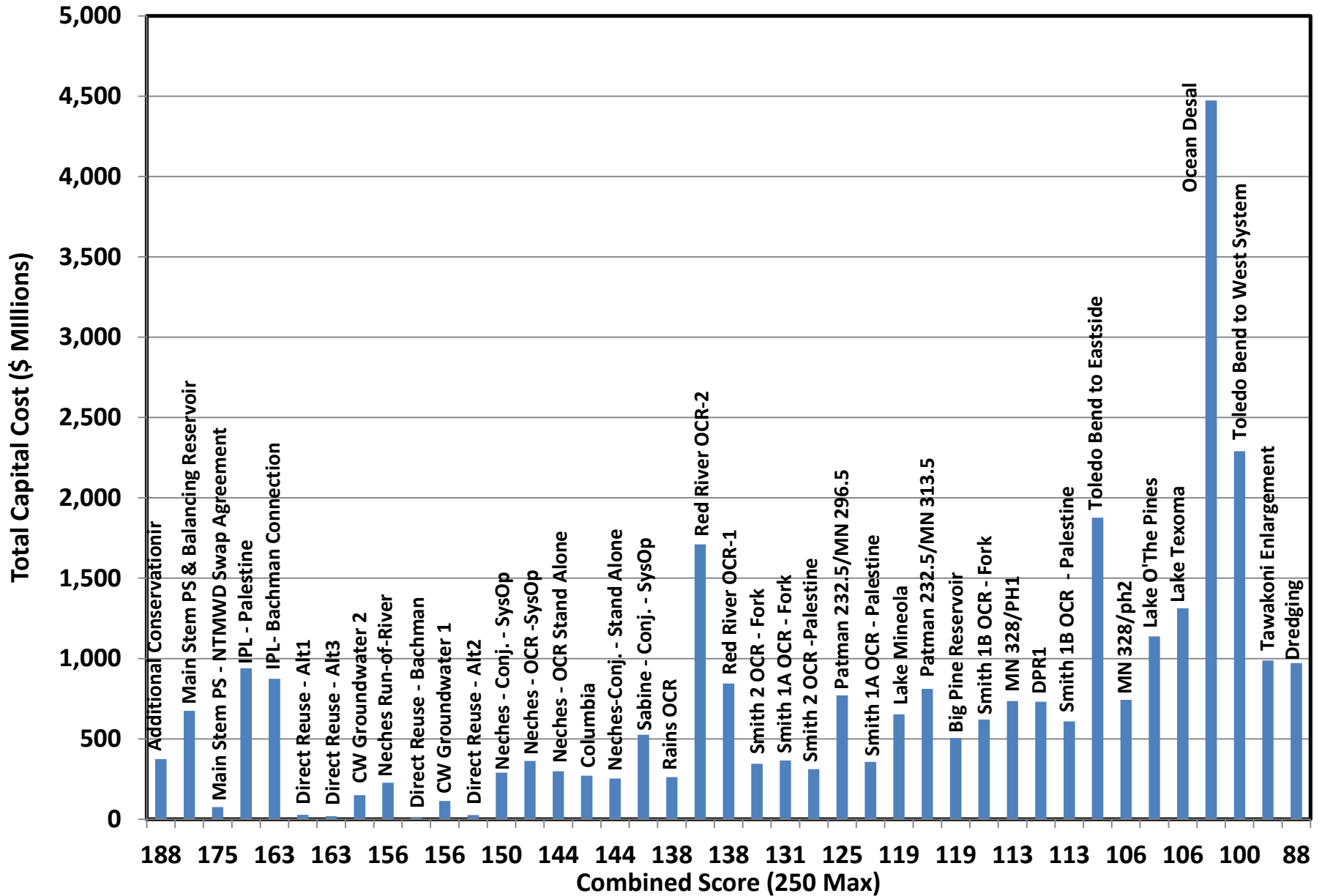
Ranking of Strategies by Combined Score



Potential Strategies - Score vs. Yield



Potential Strategies - Score vs. Capital Cost



Identified Strategies

- DWU Reuse (Additional)
- Main Stem Trinity River PS (Lake Ray Hubbard Reuse - 2013)
- Tawakoni Increase by 1ft
- Tawakoni Increase by 3ft
- Tawakoni Increase by 5.5ft
- Tawakoni Balancing Reservoir Expansion
- Marvin Nichols II Reservoir
- Marvin Nichols Reservoir
- Lake Livingston to DWU
- Lake O' the Pines to DWU
- Lake O' the Pines to Sandy Creek
- Lake O' the Pines to Sandy Creek to Lake Fork, with flow from Lake Tawakoni
- Main Stem Diversion Pump Station
- Main Stem Diversion Pipeline
- Oklahoma water to Lake Ray Roberts (Option B)
- Oklahoma water to DWU
- Pipeline - Tawakoni to Lake Ray Hubbard
- Wetland Transfer Pump Station
- Wetland Transfer Pipeline
- 100mgd WTP Expansion (Any plant)
- 100mgd WTP Expansion (Any plant)
- Direct Reuse - Alt2
- Neches - OCR Stand Alone
- Neches - OCR -SysOp
- 100mgd WTP Expansion (Any plant)
- Lake Texoma to DWU (blend)
- Lake Tawakoni Enlargement - Option 2
- Caddo Lake Enlargement
- Mesa Groundwater
- Tawakoni Balancing Reservoir to South EastWTP
- Kiamichi River to Elm Fork WTP
- Kiamichi River to Eastside WTP
- Milwood Lake
- Barkman Creek
- Rabbit
- Stateline
- Cochino Bayou
- Big Elkhart
- Boyd
- Supplemental wells
- Lake Ralph Hall – Indirect Reuse
- Wright Patman - System Operation
- Wright-Patman Lake - Texarkana Purchase
- Sam Rayburn Reservoir / B.A. Steinhagen Lake
- Joe Pool: Modified use of Water Rights
- Neches - Conj. - SysOp
- Rains OCR
- Columbia
- Dredging
- Wright Patman Exp.
- George Parkhouse II
- Joe Pool: Interruptible Water Rights
- Joe Pool: Reallocate Flood Pool Storage
- Joe Pool: Terminal Storage
- Waxahachie & Bardwell: Terminal Storage
- 100mgd WTP Expansion (Any plant)
- 100mgd WTP Expansion (Any plant)
- Bonham C of E (NTMWD)
- Lower Bois d'Arc Creek
- Ralph Hall
- Cedar Creek
- Tehuacana
- Brazos County Groundwater
- Roberts County Groundwater
- Constructed Wetland - NTMWD
- Cooper Reservoir to Irving
- Cooper Reservoir to Lake Lavon
- Dallas Supply to Ellis County Customers - Rockett SUD, Red Oak and Waxahachie
- Grand Prairie to Johnson Co SUD
- IPL Turnout to Lake Bardwell
- IPL Turnout to Lake Waxahachie
- Lake Joe Pool to Mansfield WTP
- Red River OCR-1
- Sabine - Conj. – SysOp
- Neches-Conj. - Stand Alone
- Ralph Hall
- Ocean Desal

Identified Strategies

(Continued)

- Lake Waxahachie to Howard Rd WTP and Sokoll WTP (TRWD use of Terminal Storage)
- Mansfield WTP expansion and connection to Joe Pool Lake
- Mansfield to Grand Prairie
- Mansfield to Johnson Co SUD
- Marvin Nichols I Reservoir to Lavon Lake
- Midlothian to Grand Prairie
- Conveyance Project - TRWD Reservoir System (TRA)
- Direct Reuse (UTRWD)
- Fannin County Project (NTMWD)
- Grayson County Project (GTUA)
- Indirect Reuse (TRA)
- Lake George Parkhouse North to NTMWD
- Lake George Parkhouse South to NTMWD
- Lake Joe Pool - TRWD use of Terminal Storage
- Lake Livingston to NTMWD
- Lake Livingston to TRWD
- Lake O' the Pines to NTMWD
- Lake Palestine to South East WTP
- George Parkhouse I
- Midlothian to Johnson Co SUD
- New Bonham Reservoir to Lake Lavon
- Oklahoma water to Lake Lavon (Option A)
- Oklahoma water to Chapman Lake
- Oklahoma water to Eagle Mountain Lake
- Oklahoma Water to Irving
- Pipeline - Main Stem Diversion PS to Wetland
- Roberts County project to DWU
- Arlington WTP Expansion(beyond 205mgd existing)
- Mansfield WTP 15mgd Expansion (beyond 45mgd existing)
- Midlothian Tayman WTP Expansion (beyond 13mgd existing)
- New Regional WTP on Joe Pool
- Sokoll WTP (Waxahachie & Rockett SUD; beyond 10mgd existing)
- NTMWD interim purchase from DWU
- Temporary connection for Wilmer to Hutchins for Dallas water
- Bethesda WSC connection to Arlington
- Brazos Groundwater Project to NTMWD
- Tawakoni Enlargement
- Direct Reuse - Alt3
- Neches Run-of-River
- Lake Ralph Hall - Indirect Reuse (UTRWD)
- Lake Ralph Hall (UTRWD)
- Lake Texoma - Not Authorized (blend)
- Lake Texoma – Authorized (Blend to NTMWD)
- Lake Texoma - Authorized (Desalinate for NTMWD)
- Lake Texoma - Not Authorized (Desalinate)
- Lake Texoma (Interim purchase from GTUA for NTMWD)
- Lake Texoma (Option A)
- Lake Texoma (Option B)
- Main Stem PS (Add'l East Fork for NTMWD)
- Mansfield supply to Johnson County SUD
- Marvin Nichols Reservoir (NTMWD)
- Marvin Nichols Reservoir (TRWD)
- Cedar Creek/Richland-Chambers System to TRWD
- Collin-Grayson Municipal Alliance system (GTUA)
- Conveyance Project - Indirect Reuse (TRA)
- CW Groundwater 2
- Direct Reuse - Bachman
- CW Groundwater 1
- Red River OCR-2
- Smith 2 - Fork
- Smith 1A - Fork

Identified Strategies

(Continued)

- Marvin Nichols Reservoir (UTRWD)
- Midlothian to Johnson County SUD
- Oklahoma Water to NTMWD, TRWD, UTRWD
- Purchase from Water Provider - TRWD Reservoir System (TRA)
- Purchase from Water Provider - Chapman/Cooper Reservoirs (UTRWD)
- Purchase from Water Provider - Indirect Reuse (TRA)
- Purchase from Water Provider - Indirect Reuse (UTRWD)
- Purchase from Water Provider - Joe Pool Reservoir (TRA)
- Purchase from Water Provider - Lake Texoma (GTUA)
- Purchase from Water Provider - Marvin Nichols Reservoir (TRA)
- Purchase from Water Provider - Oklahoma (TRA)
- Purchase from Water Provider - Ray Robert/Lewisville/Grapevine (UTRWD)
- Purchase from Water Provider - Toledo Bend (TRA)
- Purchase from Water Provider (1 to TRWD)
- Main Stem PS & Balance Res - Phase 2
- TRA Ellis County Reuse
- TRA Freestone County Reuse
- TRA Kaufman County Reuse
- TRA Las Colinas Reuse
- TRA to Houston Contract
- TRA to SJRA Contract
- TRA to WUG Contract
- TRWD Third Pipeline and Reuse
- TRWD Third Pipeline and Reuse (TRA)
- Wholesale Customer Conservation (GTUA)
- Wholesale Customer Conservation (NTMWD)
- Wholesale Customer Conservation (TRA)
- Wholesale Customer Conservation (TRWD)
- Wholesale Customer Conservation (UTRWD)
- Wright Patman - Reallocation of Flood Pool NTMWD
- Wright Patman - Reallocation of Flood Pool TRWD
- Wright Patman - Texarkana Sale to NTMWD
- MN328/Talco350
- Tawakoni Recycle - 1B
- Smith 2 –Palestine
- Patman 242.5/MN296.5
- Patman 232.5/Talco370
- Toledo Bend to Eastside
- Toledo Bend to SW WTP
- Wright Patman - Texarkana Sale to TRWD
- Van Zandt1A
- Van Zandt1B
- Henderson - Parallel to IPL
- Henderson - transmit via IPL
- Cedar Crest Direct Recycle
- Conservation (Retail) - from 2005 LRWSP Study
- Purchase from Water Provider (2 to TRWD)
- Roberts County Groundwater Project to NTMWD
- South East WTP at 100mgd
- South East WTP expansion to 200mgd
- Tehuacana Reservoir to Fort Worth
- TRA 10-Mile Creek Reuse Project
- TRA Denton Creek WWTP Reuse
- Conveyance Project - Toledo Bend (TRA)
- Conservation (Wholesale)
- DWU Reuse - Table Q-65 Region C 2011
- Indirect Recycle to Lewisville Lake
- Lake Mineola
- Patman 232.5/MN313.5
- Marvin Nichols
- LOTP Pipeline
- Lake Texoma

Identified Strategies

(Continued)

- Lake Tawakoni Recycled Water - Option 1A (25mgd PS @SSWWTP & 42" to Trinity Basin Wetland)
- Lake Tawakoni Recycled Water - Option 1C (125mgd PS @SSWWTP, 60" & 66" to Trinity Basin Wetland)
- Tawakoni Recycle
- Lake Tawakoni Recycled Water - Option 2A (25mgd PS @SSWWTP & 42" to Sabine Basin Wetland)
- Lake Tawakoni Recycled Water - Option 2B (55mgd PS @SSWWTP & 60" to Sabine Basin Wetland)
- Lake Tawakoni Recycled Water - Option 2C (125mgd PS @SSWWTP, 60" & 66" to Sabine Basin Wetlands)
- Love Field Corridor Direct Reuse
- Red Bird Corridor Direct Reuse
- Southside WWTP Indirect Recycle to Lake Ray Hubbard
- TRA Dallas County Reuse
- White Rock Direct Recycle
- Wright-Patman Lake - Flood Pool Reallocation
- Toledo Bend Reservoir (Option A)
- Toledo Bend Reservoir (Option B – Coop. Project, Dallas portion)
- Tawakoni Enlargement
- Livingston Pipeline
- Marvin Nichols I Reservoir (Option A – Coop. Project, Dallas Portion – to Lewisville Lake)
- Marvin Nichols I Reservoir (Option B – to Ray Roberts Lake)
- Marvin Nichols I Reservoir (Option C – to Lake Lavon)
- Carl L. Estes
- Mineola Conservation Pool 403ft
- Mineola Conservation Pool 437.5ft
- Columbia to DWU then Lake Palestine
- Eastex
- Fastrill Replacement
- Carrizo-Wilcox Groundwater
- Remote Well Field Development
- Alta Mesa PS Expansion
- Arlington to Grand Prairie
- Wilmer to Dallas Connection
- Constructed Wetland
- Constructed Wetland - DWU
- Conveyance Pipeline
- Conveyance Pipeline Branch to Lake Ray Hubbard
- Conveyance Pipeline to Branch
- Conveyance Pipeline to Outfall
- Conveyance Pump Station
- East Fork Diversion PS
- Lake Sam Rayburn to Lake Palestine
- Toledo Bend Project
- Additional Lake Ray Hubbard
- Lake Lavon to Dallas County
- Lake Lavon to Lewisville Lake
- Lake Lewisville to Lake Eagle Mountain
- SS Pipeline to Lake Ray Hubbard
- SS Pipeline to Wetland
- SS Pump Station to Lake Ray Hubbard
- SS Pump Station to Wetland
- SSWWTP Pump Station
- System Infrastructure
- Tawakoni Pump Station
- Toledo Bend Pipeline - Toledo Bend to Prairie Creek
- Toledo Bend Pipeline - 2 Stage from Toledo Bend to Prairie Creek to Lake Fork, with flow from Lake Tawakoni
- Wintergreen PS
- Wright Patman Lake (Coop. Project, Dallas portion – to Lewisville Lake)
- East Side WTP Expansion to 540mgd (of 490mgd or 600mgd)
- Elm Fork WTP Expansion to 310mgd
- Big Pine Reservoir

Identified Strategies

(Continued)

- Big Sandy
- Highway 322
- Kilgore
- Mill Creek
- Prairie Creek
- Socagee
- New Lake Tawakoni Conservation Pool
- Tenaha
- Waters Bluff
- Ponta
- Gail
- Hurricane Bayou
- Italy
- Lower Keechi
- Muenster (Upstream of Lake Ray Roberts)
- Roanoke
- Tennessee Colony
- Upper Keechi Creek
- Additional pipeline from Lake Tawakoni (2015)
- IPL Connection - Scenario 1: Pipeline Directly to Bachman WTP
- IPL Connection - Scenario 2a: Joe Pool /Mountain Creek pass through
- Smith 1A - Palestine
- Smith 1B- Fork
- IPL Connection - Scenario 2c: Through Joe Pool+ Naturally Available Storage+ Water Rights
- IPL Connection - Scenario 2d: Through Joe Pool+ Naturally Available Storage& Water Rights+ Mountain Creek Natural Storage
- IPL Connection - Scenario 2e: Through Joe Pool+ Naturally Available Storage& Water Rights+ OCSF to Bachman WTP
- IPL Connection - Scenario 2f: Through Joe Pool+ Naturally Available Storage& Water Rights+ OCSF to TRWD
- IPL Connection - Scenario 3: Joe Pool/New 150mgd Southwest WTP
- IPL Connection - Scenario 3: Through Joe Pool+Naturally Available Storage+Water Rights and Relocated Frasier Dam
- IPL Connection - Scenario 4a: Elm Fork to West Fork Connection - Bidirectional Eagle Mountain to Lewisville
- IPL Connection - Scenario 4b: Elm Fork to West Fork Connection - Bidirectional Eagle Mountain to Lewisville+OCSF to TRWD
- IPL Connection - Scenario 5: Through Joe Pool (Joe Pool Natural Storage & Water Rights) to proposed Southwest WTP
- Smith 1B – Palestine
- DPR1
- New 100mgd WTP
- SSWWTP Phosphorus Treatment
- Liberty Hill
- Pecan Bayou
- Ringgold
- Upper Little Cypress
- IPL Connection - Scenario 2b: Through Joe Pool+ Naturally Available Storage
- Livingston Pipeline
- Lake Fork Reservoir to Tawakoni Balancing Reservoir
- Lake Palestine Connection (Integrated Pipeline w/ TRWD)
- Dredging
- Southwest Treated Water Pipeline
- Tawakoni Balancing Reservoir to East Side WTP
- 100mgd WTP Expansion (Any plant)
- BachmanWTP Expansion to 130mgd
- Additional Conservation
- Main Stem PS & Bal Res
- Rowlett to LRH IPR 3a
- IPL
- Duck Creek to LRH - IPR3a
- IPR 2
- Direct Reuse - Alt1
- Main Stem PS & Balance Res - Phase 1

2005 LRWSP APPROVED WATER MANAGEMENT STRATEGIES

**City of Dallas**

March 27, 2006

Mr. E.G. Rod Pittman, Chairman
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Dear Mr. Pittman:

On December 5, 2005, the Region C Water Planning Group adopted its 2006 Region C Water Plan (the Plan) which includes recommended water supply strategies for the North Central Texas area through the year 2060. Included in the Plan are proposed water supply strategies for the City of Dallas as approved by the Dallas City Council on March 9, 2005.

The Region C Water Planning group subsequently submitted the Plan as required, to your agency for approval and inclusion in the 2007 Texas State Water Plan. We understand the next step in the State process is public hearings for all Regional Water Plans, and the Region C plan is scheduled to be heard on April 18, 2006.

Regarding Dallas and its proposed water supply strategies, there was significant input from the public from all sides, including the business and environmental community. Please be advised the City of Dallas fully supports the Texas State Water Plan process and the inclusion of our proposed strategies to meet the water demand in the Dallas area to the year 2060. We recommend the State approve the Region C Plan and our strategies as submitted.

Thank you for your time and attention in this matter. Please let me know if additional information or clarification is required.

Sincerely,

Mary K. Suhm
City Manager

- c: Honorable Mayor and Members of the City Council
Kevin Ward, Executive Administrator, Texas Water Development Board
Jo M. (Jody) Puckett, P.E., Director, Dallas Water Utilities

March 9, 2005

WHEREAS, on September 8, 2004 the City Council authorized the update of the 2000 Long Range Water Supply Plan to the year 2060, hereinafter called the 2005 Long Range Water Supply Plan; and,

WHEREAS, the 2005 Long Range Water Supply Plan provides an analysis of anticipated water demands and provides recommendations on how to meet those demands until the year 2060, as well as enhancements to facilities used in the water treatment process; and,

WHEREAS, the 2005 Long Range Water Supply Plan makes recommendations concerning actions that must be taken in order to ensure that the City of Dallas and its customers continue to have a safe and dependable water supply; and,

WHEREAS, the consultant recommended that Dallas establish realistic goals for the gallons of water used per day per capita, which reflects increased conservation and the recycling of water; and,

WHEREAS, the consultant recommended Dallas' participation in a feasibility study in the Sulphur River Basin, as well as a feasibility study for a new reservoir in the Upper Neches River basin known as Lake Fastrill; which may be located in an area that is currently being studied by the U.S. Fish and Wildlife Service as a possible wildlife refuge; and,

WHEREAS, the City Council is interested in ensuring that staff continues to be flexible in evaluating other options including future studies to identify additional water conservation and additional water recycling, as well as pursuing water from existing water supply reservoirs, to include continued participation in the Toledo Bend study, and seeking additional water supplies from Lake Texoma, Wright Patman Lake, Lake O' the Pines, and other sources that may be identified in the future; and,

WHEREAS, the Sulphur River basin study is scheduled to be completed in three phases and the City Council desires to approve Dallas' participation in each phase of this study, as well as Dallas' participation in the Upper Neches reservoir feasibility study; and,

WHEREAS, the City Council recognizes that the City of Dallas' long range water requirements and proposed strategies as identified in the attachment to the letter at Exhibit A must be identified to the Region C Planning Group now in order to be included in the State of Texas 2007 Water Plan; Now, Therefore,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF DALLAS:

Section 1. That the City Manager staff be directed to identify and submit proposed water supply strategies for the City of Dallas to the Region C Planning Group as identified in the attachment to the letter at Exhibit A.

Section 2. That the City Manager be directed to brief and obtain City Council authorization prior to initiating any water supply studies related to the recommended and alternate strategies, and any other sources yet to be identified, and that studies with multiple phases would require approvals prior to every phase.

Section 3. That the City Manager be directed to take the necessary steps with respect to investigating various water supply strategies to include seeking City Council approval for a feasibility study on Fastrill Lake in April 2005 while working with the Upper Neches River Municipal Water Authority and the U.S. Fish and Wildlife Service to determine if the Fastrill project can meet the multiple objectives of water supply and wildlife preservation, seeking City Council approval in April 2005 to participate in the Sulphur River Basin-wide study that will include studying the availability of water from Wright Patman Lake through flood pool reallocation, to participate in future feasibility studies for obtaining water from the Toledo Bend reservoir, to initiate design studies for the implementation of the Recycled Water Project for FY 2006, to pursue additional water conservation measures, to initiate a water treatability study to address Texoma water quality issues and begin steps to obtain additional reallocation of Texoma water, initiate discussions with North East Teas Municipal Water District relative to purchasing a portion of their Lake O' the Pines water, and pursue other water sources that may be identified in the future.

Section 3- 4. That this resolution shall take effect immediately from and after its passage in accordance with the provisions of the Charter of the City of Dallas and it is accordingly so resolved.

DISTRIBUTION: Water - Administration, 4AN, Cheryl Glenn
Water - Contracts, 2121 Main, Suite 300, Debra Bretel
Water - Accounting & Finance, 5AN, Ros Wilber
Office of Financial Services, 4FN, Vicki Reed

APPROVED BY
CITY COUNCIL

MAR 09 2005

Shirley Gray
City Secretary

APPROVED *Rick Green*
HEAD OF DEPARTMENT

APPROVED *Richard...*
CITY CONTROLLER

APPROVED *[Signature]*
CITY MANAGER



CITY OF DALLAS

March 17, 2005

Mr. Jim Parks, Chairman
Region C Planning Group
P.O. Box 2408
Wylie, TX 75098

Dear Mr. Parks:

Attached are the proposed strategies to meet the City of Dallas's Long Range Water supply needs to the year 2060 for inclusion in the Region C Planning Group information to update the 2007 State of Texas Water Plan. These strategies, which included both recommended and alternative options, were reviewed and approved by the Dallas City Council on March 9, 2005. The City of Dallas is pursuing a wide variety of water supply alternatives, and the City Council reserves the right to amend this list in the future.

Please let me know if you have any questions or need any additional information.

Sincerely,

Mary K. Symm
Acting City Manager

Attachment

ATTACHMENT

<u>Strategy</u>	<u>Date</u>	<u>Supply (MGD)</u>
Conservation (savings)		
	2010	15.70
	2020	22.30
	2030	28.30
	2040	34.50
	2050	40.80
	2060	47.40
Contract for Return Flows		
	2010	30.66
	2020	39.92
	2030	47.41
	2040	54.10
	2050	62.32
	2060	71.02
Recycled Water		
Direct Non-potable Use	2010	18.25
Augmentation (indirect) through Lake Ray Hubbard	2012	60.00
Augmentation (indirect) through Lake Lewisville	2022	60.00
Connect Existing Supplies		
Lake Fork	2007	107.00
Lake Palestine	2015	100.00
Obtain Water from Existing Reservoirs		
Wright Patman Lake -- Flood Pool Reallocation	2035	100.00
Develop New Reservoirs		
Fastrill	2045	100.00
Water Treatment Plants		
Expand Eastside Water Treatment Plan	2010	50.00
	2012	110.00
New Water Treatment Plant	2022	50.00
	2035	110.00
Alternative Supply Recommendations		
Additional water conservation		
Lake Texoma		
Toledo Bend Reservoir		
Lake O' the Pines		
Lake Livingston		
Sam Rayburn/B.A. Steinhagen		
Mesa groundwater		
Marvin Nichols Reservoir		
Lake Columbia		
George Parkhouse		
Oklahoma Water		

2005 LRWSP Progress

2005 LRWSP Recommended Strategies	Status	Yield
Conservation	<ul style="list-style-type: none"> • Saved an estimated 220 billion gallons of water since 2001 • GPCD has been reduced approximately 20% from FY01 to FY13 • 2005 developed Water Conservation 5 year Strategic Plan, updated in 2010 and 2015 update underway. 	50 MGD
Direct Reuse	<ul style="list-style-type: none"> • Extended Cedar Crest Golf Course Reuse line to Stevens Park Golf Course and Dallas Zoo in 2013 	0.15 MGD
Indirect Reuse <ul style="list-style-type: none"> • Contract for Return Flows • Augmentation through Ray Hubbard • Augmentation through Lake Lewisville 	<ul style="list-style-type: none"> • 2008 entered into Reuse Swap Agreement with NTMWD • 2009 began Main Stem Pump Station design and route study and • 2011 TCEQ granted Dallas Bed and Banks Reuse Permit amendment 	10 MGD
Connect Lake Fork	<ul style="list-style-type: none"> • 2009 completed 27-mile 108-inch pipeline from Lake Fork to Iron Bridge Pump Station • 2009 completed Lake Fork Pump Station 	36 MGD

2005 LRWSP Progress

(Continued)

2005 LRWSP Recommended Strategies	Status	Yield Connected
Lake Palestine	<ul style="list-style-type: none"> • 2010 entered into Water Transmission Facilities Financing Agreement with Tarrant Regional Water District • 2011 entered into Integrated Water Transmission Facilities Delivery Contract with TRWD 	0 MGD
Wright Patman Reallocation	<ul style="list-style-type: none"> • 2013 – Entered into Advanced Funding Agreement with Sulphur River Basin Authority to perform the Sulphur River Basin Wide study to evaluate water supply alternatives in the Sulphur River Basin • Regional partners: <ul style="list-style-type: none"> • North Texas Municipal Water District; • Tarrant Regional Water District; • Upper Trinity Regional Water District; and • City of Irving 	0 MGD
Lake Fastrill	<ul style="list-style-type: none"> • 2005 U.S. Fish and Wildlife Service established the Neches Wildlife Refuge within the footprint of Lake Fastrill • Dallas, and Texas Water Development Board • 2010 Wildlife Refuge became official when the U.S. Supreme Court declined to hear the lawsuit. • 2012 Upper Neches River Municipal Water Authority began study to evaluate the Neches River run-of-the-river water rights 	0 MGD

2011 Region C Water Plan

Water Management Strategies for Dallas Water Utilities

Planned Supplies (MGD)	2010	2020	2030	2040	2050	2060
Projected Demands	542	615	654	703	771	888
Total Available Supplies	498	462	469	473	479	490
Water Management Strategies						
Conservation (DWU Retail)	16	24	25	30	37	47
Conservation (Wholesale Customers)	6	14	23	28	33	40
Additional Dry Year Supply	22	0	0	0	0	0
Main Stem Trinity Pump Station (Lake Ray Hubbard Indirect Reuse)		28	32	35	36	37
Additional Direct Reuse		18	18	18	18	18
Additional Pipeline from Lake Tawakoni (More Lk. Fork Supply)		70	68	66	64	62
Connect Lake Palestine (Integrated Pipeline with TRWD)		100	99	98	97	96
Wright Patman Lake				100	100	100
Fastrill Replacement Strategy						100
Infrastructure and Operational Improvements						
Lake Ray Hubbard Operational Efficiency Supply	X	X	X	X	X	X
Southwest Treated Water Pipe		X	X	X	X	X
WTP Expansions			X	X	X	X
Total Supplies from Strategies	45	254	265	375	385	500
Total Supplies	543	716	734	849	864	989
Reserve or (Shortage)	2	101	80	146	93	102